



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : C12N 15/12, C07K 14/72, G01N 33/50, 33/566	A1	(11) International Publication Number: WO 00/22129 (43) International Publication Date: 20 April 2000 (20.04.00)
(21) International Application Number: PCT/US99/23938 (22) International Filing Date: 12 October 1999 (12.10.99) (30) Priority Data: 09/170,496 13 October 1998 (13.10.98) US (63) Related by Continuation (CON) or Continuation-in-Part (CIP) to Earlier Application US 09/170,496 (CIP) Filed on 13 October 1998 (13.10.98) (71) Applicant (for all designated States except US): ARENA PHARMACEUTICALS, INC. [US/US]; 6166 Nancy Ridge Drive, San Diego, CA 92121 (US). (72) Inventors; and (75) Inventors/Applicants (for US only): BEHAN, Dominic, P. [GB/US]; 11472 Roxboro Court, San Diego, CA 92131 (US); CHALMERS, Derek, T. [GB/US]; 347 Longden Lane, Solana Beach, CA 92075 (US); LIAW, Chen, W. [US/US]; 7668 Salix Place, San Diego, CA 92129 (US).	(74) Agents: MILLER, Suzanne, E. et al.; Woodcock Washburn Kurtz Mackiewicz & Norris LLP, 46th floor, One Liberty Place, Philadelphia, PA 19103 (US). (81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>	
(54) Title: NON-ENDOGENOUS, CONSTITUTIVELY ACTIVATED HUMAN G PROTEIN-COUPLED RECEPTORS		
(57) Abstract Disclosed herein are constitutively activated, non-endogenous versions of endogenous human G protein-coupled receptors comprising (a) the following amino acid sequence region (C-terminus to N-terminus orientation) and/or (b) the following nucleic acid sequence region (3' to 5' orientation) transversing the transmembrane-6 (TM6) and intracellular loop-3 (IC3) regions of the GPCR: (a) P ¹ AA ₁₅ X and/or (b) P ^{codon} (AA-codon) ₁₅ X _{codon} , respectively. In a most preferred embodiment, P ¹ and P ^{codon} are endogenous proline and an endogenous nucleic acid encoding region encoding proline, respectively, located within TM6 of the non-endogenous GPCR; AA ₁₅ and (AA-codon) ₁₅ are 15 endogenous amino acid residues and 15 codons encoding endogenous amino acid residues, respectively; and X and X _{codon} are non-endogenous lysine and a non-endogenous nucleic acid encoding region encoding lysine, respectively, located within IC3 of the non-endogenous GPCR. Because it is most preferred that the non-endogenous human GPCRs which incorporate these mutations are incorporated into mammalian cells and utilized for the screening of the candidate compounds, the non-endogenous human GPCR incorporating the mutation need not be purified and isolated <i>per se</i> (i.e., these are incorporated within the cellular membrane of a mammalian cell), although such purified and isolated non-endogenous human GPCRs are well within the purview of this disclosure.		

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

**NON-ENDOGENOUS, CONSTITUTIVELY ACTIVATED
HUMAN G PROTEIN-COUPLED RECEPTORS**

The benefits of commonly owned U.S. Serial Number 09/170,496, filed October 13, 1998, U.S. Serial Number 08/839, 449 filed April 14, 1997 (now abandoned),
5 U.S. Serial Number 09/060,188, filed April 14, 1998; U.S. Provisional Number 60/090,783, filed June 26, 1998; and U.S. Provisional Number 60/095,677, filed on August 7, 1998, are hereby claimed. Each of the foregoing applications are incorporated by reference herein in their entirety.

FIELD OF THE INVENTION

10 The invention disclosed in this patent document relates to transmembrane receptors, and more particularly to human G protein-coupled receptors (GPCRs) which have been altered such that altered GPCRs are constitutively activated. Most preferably, the altered human GPCRs are used for the screening of therapeutic compounds.

- 2 -

BACKGROUND OF THE INVENTION

Although a number of receptor classes exist in humans, by far the most abundant and therapeutically relevant is represented by the G protein-coupled receptor (GPCR or GPCRs) class. It is estimated that there are some 100,000 genes within the human genome, and of these, approximately 2% or 2,000 genes, are estimated to code for GPCRs. Of these, there are approximately 100 GPCRs for which the endogenous ligand that binds to the GPCR has been identified. Because of the significant time-lag that exists between the discovery of an endogenous GPCR and its endogenous ligand, it can be presumed that the remaining 1,900 GPCRs will be identified and characterized long before the endogenous ligands for these receptors are identified.

Indeed, the rapidity by which the Human Genome Project is sequencing the 100,000 human genes indicates that the remaining human GPCRs will be fully sequenced within the next few years. Nevertheless, and despite the efforts to sequence the human genome, it is still very unclear as to how scientists will be able to rapidly, effectively and efficiently exploit this information to improve and enhance the human condition. The present invention is geared towards this important objective.

Receptors, including GPCRs, for which the endogenous ligand has been identified are referred to as "known" receptors, while receptors for which the endogenous ligand has not been identified are referred to as "orphan" receptors. This distinction is not merely semantic, particularly in the case of GPCRs. GPCRs represent an important area for the development of pharmaceutical products: from approximately 20 of the 100 known GPCRs, 60% of all prescription pharmaceuticals have been developed. Thus, the orphan GPCRs are to the pharmaceutical industry what gold was to California in the late 19th century – an opportunity to drive growth, expansion, enhancement and development. A serious drawback exists, however,

- 3 -

with orphan receptors relative to the discovery of novel therapeutics. This is because the traditional approach to the discovery and development of pharmaceuticals has required access to both the receptor *and* its endogenous ligand. Thus, heretofore, orphan GPCRs have presented the art with a tantalizing and undeveloped resource for the discovery of pharmaceuticals.

5 Under the traditional approach to the discovery of potential therapeutics, it is generally the case that the receptor is first identified. Before drug discovery efforts can be initiated, elaborate, time consuming and expensive procedures are typically put into place in order to identify, isolate and generate the receptor's endogenous ligand - this process can require from between 3 and ten years per receptor, at a cost of about \$5million (U.S.) per receptor. These time and financial
10 resources must be expended before the traditional approach to drug discovery can commence.

This is because traditional drug discovery techniques rely upon so-called "competitive binding assays" whereby putative therapeutic agents are "screened" against the receptor in an effort to discover compounds that either block the endogenous ligand from binding to the receptor ("antagonists"), or enhance or mimic the effects of the ligand binding to the receptor ("agonists").

15 The overall objective is to identify compounds that prevent cellular activation when the ligand binds to the receptor (the antagonists), or that enhance or increase cellular activity that would otherwise occur if the ligand was properly binding with the receptor (the agonists). Because the endogenous ligands for orphan GPCRs are by definition not identified, the ability to discover novel and unique therapeutics to these receptors using traditional drug discovery techniques is not
20 possible. The present invention, as will be set forth in greater detail below, overcomes these and other severe limitations created by such traditional drug discovery techniques.

GPCRs share a common structural motif. All these receptors have seven sequences of between 22 to 24 hydrophobic amino acids that form seven alpha helices, each of which spans the

- 4 -

membrane (each span is identified by number, *i.e.*, transmembrane-1 (TM-1), transmembrane-2 (TM-2), etc.). The transmembrane helices are joined by strands of amino acids between transmembrane-2 and transmembrane-3, transmembrane-4 and transmembrane-5, and transmembrane-6 and transmembrane-7 on the exterior, or "extracellular" side, of the cell membrane (these are referred to as "extracellular" regions 1, 2 and 3 (EC-1, EC-2 and EC-3), respectively). The transmembrane helices are also joined by strands of amino acids between transmembrane-1 and transmembrane-2, transmembrane-3 and transmembrane-4, and transmembrane-5 and transmembrane-6 on the interior, or "intracellular" side, of the cell membrane (these are referred to as "intracellular" regions 1, 2 and 3 (IC-1, IC-2 and IC-3), respectively). The "carboxy" ("C") terminus of the receptor lies in the intracellular space within the cell, and the "amino" ("N") terminus of the receptor lies in the extracellular space outside of the cell. The general structure of G protein-coupled receptors is depicted in Figure 1.

Generally, when an endogenous ligand binds with the receptor (often referred to as "activation" of the receptor), there is a change in the conformation of the intracellular region that allows for coupling between the intracellular region and an intracellular "G-protein." Although other G proteins exist, currently, Gq, Gs, Gi, and Go are G proteins that have been identified. Endogenous ligand-activated GPCR coupling with the G-protein begins a signaling cascade process (referred to as "signal transduction"). Under normal conditions, signal transduction ultimately results in cellular activation or cellular inhibition. It is thought that the IC-3 loop as well as the carboxy terminus of the receptor interact with the G protein. A principal focus of this invention is directed to the transmembrane-6 (TM6) region and the intracellular-3 (IC3) region of the GPCR.

Under physiological conditions, GPCRs exist in the cell membrane in equilibrium between

- 5 -

two different conformations: an "inactive" state and an "active" state. As shown schematically in Figure 2, a receptor in an inactive state is unable to link to the intracellular signaling transduction pathway to produce a biological response. Changing the receptor conformation to the active state allows linkage to the transduction pathway (via the G-protein) and produces a biological response.

5 A receptor may be stabilized in an active state by an endogenous ligand or a compound such as a drug. Recent discoveries, including but not exclusively limited to modifications to the amino acid sequence of the receptor, provide means other than endogenous ligands or drugs to promote and stabilize the receptor in the active state conformation. These means effectively stabilize the receptor in an active state by simulating the effect of an endogenous ligand binding
10 to the receptor. Stabilization by such ligand-independent means is termed "constitutive receptor activation."

As noted above, the use of an orphan receptor for screening purposes has not been possible. This is because the traditional "dogma" regarding screening of compounds mandates that the ligand for the receptor be known. By definition, then, this approach has no applicability with
15 respect to orphan receptors. Thus, by adhering to this dogmatic approach to the discovery of therapeutics, the art, in essence, has taught and has been taught to forsake the use of orphan receptors unless and until the endogenous ligand for the receptor is discovered. Given that there are an estimated 2,000 G protein coupled receptors, the majority of which are orphan receptors, such dogma castigates a creative, unique and distinct approach to the discovery of therapeutics.

20 Information regarding the nucleic acid and/or amino acid sequences of a variety of GPCRs is summarized below in Table A. Because an important focus of the invention disclosed herein is directed towards orphan GPCRs, many of the below-cited references are related to orphan GPCRs. However, this list is not intended to imply, nor is this list to be construed, legally or

- 6 -

otherwise, that the invention disclosed herein is only applicable to orphan GPCRs or the specific GPCRs listed below. Additionally, certain receptors that have been isolated are not the subject of publications per se; for example, reference is made to a G Protein-Coupled Receptor database on the "world-wide web" (neither the named inventors nor the assignee have any affiliation with this site) that lists GPCRs. Other GPCRs are the subject of patent applications owned by the present assignee and these are not listed below (including GPR3, GPR6 and GPR12; see U.S. Provisional Number 60/094879):

Table A

Receptor Name	Publication Reference
GPR1	23 Genomics 609 (1994)
GPR4	14 DNA and Cell Biology 25 (1995)
GPR5	14 DNA and Cell Biology 25 (1995)
GPR7	28 Genomics 84 (1995)
GPR8	28 Genomics 84 (1995)
GPR9	184 J. Exp. Med. 963 (1996)
GPR10	29 Genomics 335 (1995)
GPR15	32 Genomics 462 (1996)
GPR17	70 J Neurochem. 1357 (1998)
GPR18	42 Genomics 462 (1997)
GPR20	187 Gene 75 (1997)
GPR21	187 Gene 75 (1997)
GPR22	187 Gene 75 (1997)
GPR24	398 FEBS Lett. 253 (1996)
GPR30	45 Genomics 607 (1997)
GPR31	42 Genomics 519 (1997)
GPR32	50 Genomics 281 (1997)
GPR40	239 Biochem. Biophys. Res. Commun. 543 (1997)
GPR41	239 Biochem. Biophys. Res. Commun. 543 (1997)
GPR43	239 Biochem. Biophys. Res. Commun. 543 (1997)
APJ	136 Gene 355 (1993)
BLR1	22 Eur. J. Immunol. 2759 (1992)
CEPR	231 Biochem. Biophys. Res. Commun. 651 (1997)
EBI1	23 Genomics 643 (1994)
EBI2	67 J. Virol. 2209 (1993)
ETBR-LP2	424 FEBS Lett. 193 (1998)
GPCR-CNS	54 Brain Res. Mol. Brain Res. 152 (1998); 45 Genomics 68 (1997)
GPR-NGA	394 FEBS Lett. 325 (1996)
H9	386 FEBS Lett 219 (1996)

- 7 -

HBA954	1261 Biochim. Biophys. Acta 121 (1995)
HG38	247 Biochem. Biophys. Res. Commun. 266 (1998)
HM74	5 Int. Immunol. 1239 (1993)
OGR1	35 Genomics 397 (1996)
V28	163 Gene 295 (1995)

As will be set forth and disclosed in greater detail below, utilization of a mutational cassette to modify the endogenous sequence of a human GPCR leads to a constitutively activated version of the human GPCR. These non-endogenous, constitutively activated versions of human GPCRs can be utilized, *inter alia*, for the screening of candidate compounds to directly identify compounds of, e.g., therapeutic relevance.

SUMMARY OF THE INVENTION

Disclosed herein is a non-endogenous, human G protein-coupled receptor comprising

(a) as a most preferred amino acid sequence region (C-terminus to N-terminus orientation) and/or (b) as a most preferred nucleic acid sequence region (3' to 5' orientation) transversing

the transmembrane-6 (TM6) and intracellular loop-3 (IC3) regions of the GPCR:

(a) P¹ AA₁₅ X

wherein:

- (1) P¹ is an amino acid residue located within the TM6 region of the GPCR, where P¹ is selected from the group consisting of (i) the endogenous GPCR's proline residue, and (ii) a non-endogenous amino acid residue other than proline;
- (2) AA₁₅ are 15 amino acids selected from the group consisting of

- 8 -

(a) the endogenous GPCR's amino acids (b) non-endogenous amino acid residues, and (c) a combination of the endogenous GPCR's amino acids and non-endogenous amino acids, excepting that none of the 15 endogenous amino acid residues that are positioned within the TM6 region of the GPCR is proline; and

- (3) X is a non-endogenous amino acid residue located within the IC3 region of said GPCR, preferably selected from the group consisting of lysine, histidine and arginine, and most preferably lysine, excepting that when the endogenous amino acid at position X is lysine, then X is an amino acid other than lysine, preferably alanine;

and/or

(b) $P^{\text{codon}} (AA\text{-codon})_{15} X_{\text{codon}}$

wherein:

- (1) P^{codon} is a nucleic acid sequence within the TM6 region of the GPCR, where P^{codon} encodes an amino acid selected from the group consisting of (i) the endogenous GPCR's proline residue, and (ii) a non-endogenous amino acid residue other than proline;
- (2) $(AA\text{-codon})_{15}$ are 15 codons encoding 15 amino acids selected from the group consisting of (a) the endogenous GPCR's amino acids (b) non-endogenous amino acid residues and (c) a combination of the endogenous GPCR's amino acids and non-

- 9 -

endogenous amino acids, excepting that none of the 15
endogenous codons within the TM6 region of the GPCR encodes
a proline amino acid residue; and

- (3) X_{codon} is a nucleic acid encoding region residue located within the
IC3 region of said GPCR, where X_{codon} encodes a non-endogenous
amino acid, preferably selected from the group consisting of
lysine, histidine and arginine, and most preferably lysine,
excepting that when the endogenous encoding region at position
 X_{codon} encodes the amino acid lysine, then X_{codon} encodes an amino
acid other than lysine, preferably alanine.

The terms endogenous and non-endogenous in reference to these sequence cassettes are relative to the endogenous GPCR. For example, once the endogenous proline residue is located within the TM6 region of a particular GPCR, and the 16th amino acid therefrom is identified for mutation to constitutively activate the receptor, it is also possible to mutate the endogenous proline residue

(i.e., once the marker is located and the 16th amino acid to be mutated is identified, one may mutate the marker itself), although it is most preferred that the proline residue not be mutated. Similarly, and while it is most preferred that AA₁₅ be maintained in their endogenous forms, these amino acids may also be mutated. The only amino acid that must be mutated in the non-endogenous version of the human GPCR is X i.e., the endogenous amino acid that is 16 residues from P¹

cannot be maintained in its endogenous form and must be mutated, as further disclosed herein. Stated again, while it is preferred that in the non-endogenous version of the human GPCR, P¹ and AA₁₅ remain in their endogenous forms (i.e., identical to their wild-type forms), once X is identified and mutated, any and/or all of P¹ and AA₁₅ can be mutated. This applies to the nucleic

- 10 -

acid sequences as well. In those cases where the endogenous amino acid at position X is lysine, then in the non-endogenous version of such GPCR, X is an amino acid other than lysine, preferably alanine.

Accordingly, and as a hypothetical example, if the endogenous GPCR has the following
5 endogenous amino acid sequence at the above-noted positions:

P-AACCTTGRRRDDDE -Q

then any of the following exemplary and hypothetical cassettes would fall within the scope of the disclosure (non-endogenous amino acids are set forth in bold):

P-AACCTTGRRRDDDE -K

10 P-AACCT**TH**IGRRDDDE -K

P-A**DE**ETTGRRRDDDE -A

P-LLKFMSTWZLV**AA**PQ -K

A-LLKFMSTWZLV**AA**PQ -K

It is also possible to add amino acid residues within AA₁₅, but such an approach is not particularly
15 advanced. Indeed, in the most preferred embodiments, the only amino acid that differs in the non-endogenous version of the human GPCR as compared with the endogenous version of that GPCR is the amino acid in position X; mutation of this amino acid itself leads to constitutive activation of the receptor.

Thus, in particularly preferred embodiments, P¹ and P^{codon} are endogenous proline and an
20 endogenous nucleic acid encoding region encoding proline, respectively; and X and X_{codon} are non-endogenous lysine or alanine and a non-endogenous nucleic acid encoding region encoding lysine or alanine, respectively, with lysine being most preferred. Because it is most preferred that the non-endogenous versions of the human GPCRs which incorporate these mutations are

- 11 -

incorporated into mammalian cells and utilized for the screening of candidate compounds, the non-endogenous human GPCR incorporating the mutation need not be purified and isolated *per se* (i.e., these are incorporated within the cellular membrane of a mammalian cell), although such purified and isolated non-endogenous human GPCRs are well within the purview of this disclosure. Gene-targeted and transgenic non-human mammals (preferably rats and mice) incorporating the non-endogenous human GPCRs are also within the purview of this invention; in particular, gene-targeted mammals are most preferred in that these animals will incorporate the non-endogenous versions of the human GPCRs in place of the non-human mammal's endogenous GPCR-encoding region (techniques for generating such non-human mammals to replace the non-human mammal's protein encoding region with a human encoding region are well known; see, for example, U.S. Patent No. 5,777,194.)

It has been discovered that these changes to an endogenous human GPCR render the GPCR constitutively active such that, as will be further disclosed herein, the non-endogenous, constitutively activated version of the human GPCR can be utilized for, *inter alia*, the direct screening of candidate compounds without the need for the endogenous ligand. Thus, methods for using these materials, and products identified by these methods are also within the purview of the following disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows a generalized structure of a G protein-coupled receptor with the numbers assigned to the transmembrane helices, the intracellular loops, and the extracellular loops.

Figure 2 schematically shows the two states, active and inactive, for a typical G protein coupled receptor and the linkage of the active state to the second messenger transduction pathway.

- 12 -

Figure 3 is a sequence diagram of the preferred vector pCMV, including restriction enzymen site locations.

Figure 4 is a diagrammatic representation of the signal measured comparing pCMV, non-endogenous, constitutively active GPR30 inhibition of GPR6-mediated activation of CRE-Luc
5 reporter with endogenous GPR30 inhibition of GPR6-mediated activation of CRE-Luc reporter.

Figure 5 is a diagrammatic representation of the signal measured comparing pCMV, non-endogenous, constitutively activated GPR17 inhibition of GPR3-mediated activation of CRE-Luc
10 reporter with endogenous GPR17 inhibition of GPR3-mediated activation of CRE-Luc reporter.

Figure 6 provides diagrammatic results of the signal measured comparing control pCMV, endogenous APJ and non-endogenous APJ.

Figure 7 provides an illustration of IP_3 production from non-endogenous human 5-HT_{2A} receptor as compared to the endogenous version of this receptor.

15 **Figure 8** are dot-blot format results for GPR1 (8A), GPR30 (8B) and APJ (8C).

DETAILED DESCRIPTION

The scientific literature that has evolved around receptors has adopted a number of terms to refer to ligands having various effects on receptors. For clarity and consistency, the following definitions will be used throughout this patent document. To the extent that these definitions
20 conflict with other definitions for these terms, the following definitions shall control:

AGONISTS shall mean compounds that activate the intracellular response when they bind to the receptor, or enhance GTP binding to membranes.

- 13 -

AMINO ACID ABBREVIATIONS used herein are set below:

	ALANINE	ALA	A
	ARGININE	ARG	R
	ASPARAGINE	ASN	N
5	ASPARTIC ACID	ASP	D
	CYSTEINE	CYS	C
	GLUTAMIC ACID	GLU	E
	GLUTAMINE	GLN	Q
	GLYCINE	GLY	G
10	HISTIDINE	HIS	H
	ISOLEUCINE	ILE	I
	LEUCINE	LEU	L
	LYSINE	LYS	K
	METHIONINE	MET	M
15	PHENYLALANINE	PHE	F
	PROLINE	PRO	P
	SERINE	SER	S
	THREONINE	THR	T
	TRYPTOPHAN	TRP	W
20	TYROSINE	TYR	Y
	VALINE	VAL	V

PARTIAL AGONISTS shall mean compounds which activate the intracellular response when they bind to the receptor to a lesser degree/extent than do agonists, or enhance GTP binding to membranes to a lesser degree/extent than do agonists

25 **ANTAGONIST** shall mean compounds that competitively bind to the receptor at the same site as the agonists but which do not activate the intracellular response initiated by the active form of the receptor, and can thereby inhibit the intracellular responses by agonists or partial agonists. **ANTAGONISTS** do not diminish the baseline intracellular response in the absence of an agonist or partial agonist.

30 **CANDIDATE COMPOUND** shall mean a molecule (for example, and not limitation, a chemical compound) which is amenable to a screening technique. Preferably, the phrase

- 14 -

"candidate compound" does not include compounds which were publicly known to be compounds selected from the group consisting of inverse agonist, agonist or antagonist to a receptor, as previously determined by an indirect identification process ("indirectly identified compound"); more preferably, not including an indirectly identified compound which has previously been
5 determined to have therapeutic efficacy in at least one mammal; and, most preferably, not including an indirectly identified compound which has previously been determined to have therapeutic utility in humans.

CODON shall mean a grouping of three nucleotides (or equivalents to nucleotides) which generally comprise a nucleoside (adenosine (A), guanosine (G), cytidine (C), uridine (U) and
10 thymidine (T)) coupled to a phosphate group and which, when translated, encodes an amino acid.

COMPOUND EFFICACY shall mean a measurement of the ability of a compound to inhibit or stimulate receptor functionality, as opposed to receptor binding affinity. A preferred means of detecting compound efficacy is via measurement of, e.g., [³⁵S]GTPγS binding, as further disclosed in the Example section of this patent document.

15 **CONSTITUTIVELY ACTIVATED RECEPTOR** shall mean a receptor subject to constitutive receptor activation. In accordance with the invention disclosed herein, a non-endogenous, human constitutively activated G protein-coupled receptor is one that has been mutated to include the amino acid cassette P¹AA₁₅X, as set forth in greater detail below.

CONSTITUTIVE RECEPTOR ACTIVATION shall mean stabilization of a receptor
20 in the active state by means other than binding of the receptor with its endogenous ligand or a chemical equivalent thereof. Preferably, a G protein-coupled receptor subjected to constitutive receptor activation in accordance with the invention disclosed herein evidences at least a 10% difference in response (increase or decrease, as the case may be) to the signal measured for

- 15 -

constitutive activation as compared with the endogenous form of that GPCR, more preferably, about a 25% difference in such comparative response, and most preferably about a 50% difference in such comparative response. When used for the purposes of directly identifying candidate compounds, it is most preferred that the signal difference be at least about 50% such that there is
5 a sufficient difference between the endogenous signal and the non-endogenous signal to differentiate between selected candidate compounds. In most instances, the "difference" will be an increase in signal; however, with respect to Gs-coupled GPCRS, the "difference" measured is preferably a decrease, as will be set forth in greater detail below.

CONTACT or **CONTACTING** shall mean bringing at least two moieties together,
10 whether in an in vitro system or an in vivo system.

DIRECTLY IDENTIFYING or **DIRECTLY IDENTIFIED**, in relationship to the phrase "candidate compound", shall mean the screening of a candidate compound against a constitutively activated G protein-coupled receptor, and assessing the compound efficacy of such compound. This phrase is, under no circumstances, to be interpreted or understood to be
15 encompassed by or to encompass the phrase "indirectly identifying" or "indirectly identified."

ENDOGENOUS shall mean a material that is naturally produced by the genome of the species. ENDOGENOUS in reference to, for example and not limitation, GPCR, shall mean that which is naturally produced by a human, an insect, a plant, a bacterium, or a virus. By contrast, the term **NON-ENDOGENOUS** in this context shall mean that which is not naturally produced
20 by the genome of a species. For example, and not limitation, a receptor which is not constitutively active in its endogenous form, but when mutated by using the cassettes disclosed herein and thereafter becomes constitutively active, is most preferably referred to herein as a "non-endogenous, constitutively activated receptor." Both terms can be utilized to describe both "in

- 16 -

vivo" and "in vitro" systems. For example, and not limitation, in a screening approach, the endogenous or non-endogenous receptor may be in reference to an in vitro screening system whereby the receptor is expressed on the cell-surface of a mammalian cell. As a further example and not limitation, where the genome of a mammal has been manipulated to include a non-
5 endogenous constitutively activated receptor, screening of a candidate compound by means of an in vivo system is viable.

HOST CELL shall mean a cell capable of having a Plasmid and/or Vector incorporated therein. In the case of a prokaryotic Host Cell, a Plasmid is typically replicated as an autonomous molecule as the Host Cell replicates (generally, the Plasmid is thereafter isolated for introduction
10 into a eukaryotic Host Cell); in the case of a eukaryotic Host Cell, a Plasmid is integrated into the cellular DNA of the Host Cell such that when the eukaryotic Host Cell replicates, the Plasmid replicates. Preferably, for the purposes of the invention disclosed herein, the Host Cell is eukaryotic, more preferably, mammalian, and most preferably selected from the group consisting of 293, 293T and COS-7 cells.

INDIRECTLY IDENTIFYING or **INDIRECTLY IDENTIFIED** means the traditional
15 approach to the drug discovery process involving identification of an endogenous ligand specific for an endogenous receptor, screening of candidate compounds against the receptor for determination of those which interfere and/or compete with the ligand-receptor interaction, and assessing the efficacy of the compound for affecting at least one second messenger pathway
20 associated with the activated receptor.

INHIBIT or **INHIBITING**, in relationship to the term "response" shall mean that a response is decreased or prevented in the presence of a compound as opposed to in the absence of the compound.

- 17 -

INVERSE AGONISTS shall mean compounds which bind to either the endogenous form of the receptor or to the constitutively activated form of the receptor, and which inhibit the baseline intracellular response initiated by the active form of the receptor below the normal base level of activity which is observed in the absence of agonists or partial agonists, or decrease GTP binding to membranes. Preferably, the baseline intracellular response is inhibited in the presence of the inverse agonist by at least 30%, more preferably by at least 50%, and most preferably by at least 75%, as compared with the baseline response in the absence of the inverse agonist.

KNOWN RECEPTOR shall mean an endogenous receptor for which the endogenous ligand specific for that receptor has been identified.

10 **LIGAND** shall mean an endogenous, naturally occurring molecule specific for an endogenous, naturally occurring receptor.

MUTANT or **MUTATION** in reference to an endogenous receptor's nucleic acid and/or amino acid sequence shall mean a specified change or changes to such endogenous sequences such that a mutated form of an endogenous, non-constitutively activated receptor evidences constitutive activation of the receptor. In terms of equivalents to specific sequences, a subsequent mutated form of a human receptor is considered to be equivalent to a first mutation of the human receptor if (a) the level of constitutive activation of the subsequent mutated form of the receptor is substantially the same as that evidenced by the first mutation of the receptor; and (b) the percent sequence (amino acid and/or nucleic acid) homology between the subsequent mutated form of the receptor and the first mutation of the receptor is at least about 80%, more preferably at least about 90% and most preferably at least 95%. Ideally, and owing to the fact that the most preferred cassettes disclosed herein for achieving constitutive activation includes a single amino acid and/or codon change between the endogenous and the non-endogenous forms of the GPCR (i.e. X or

- 18 -

X_{codon}), the percent sequence homology should be at least 98%.

ORPHAN RECEPTOR shall mean an endogenous receptor for which the endogenous ligand specific for that receptor has not been identified or is not known.

PHARMACEUTICAL COMPOSITION shall mean a composition comprising at least
5 one active ingredient, whereby the composition is amenable to investigation for a specified, efficacious outcome in a mammal (for example, and not limitation, a human). Those of ordinary skill in the art will understand and appreciate the techniques appropriate for determining whether an active ingredient has a desired efficacious outcome based upon the needs of the artisan.

PLASMID shall mean the combination of a Vector and cDNA. Generally, a Plasmid is
10 introduced into a Host Cell for the purpose of replication and/or expression of the cDNA as a protein.

STIMULATE or **STIMULATING**, in relationship to the term "response" shall mean that a response is increased in the presence of a compound as opposed to in the absence of the compound.

15 **TRANSVERSE** or **TRANSVERSING**, in reference to either a defined nucleic acid sequence or a defined amino acid sequence, shall mean that the sequence is located within at least two different and defined regions. For example, in an amino acid sequence that is 10 amino acid moieties in length, where 3 of the 10 moieties are in the TM6 region of a GPCR and the remaining
7 moieties are in the IC3 region of the GPCR, the 10 amino acid moiety can be described as
20 transversing the TM6 and IC3 regions of the GPCR.

VECTOR in reference to cDNA shall mean a circular DNA capable of incorporating at least one cDNA and capable of incorporation into a Host Cell.

The order of the following sections is set forth for presentational efficiency and is not

- 19 -

intended, nor should be construed, as a limitation on the disclosure or the claims to follow.

A. Introduction

The traditional study of receptors has always proceeded from the a priori assumption (historically based) that the endogenous ligand must first be identified before discovery could proceed to find antagonists and other molecules that could affect the receptor. Even in cases where an antagonist might have been known first, the search immediately extended to looking for the endogenous ligand. This mode of thinking has persisted in receptor research even after the discovery of constitutively activated receptors. What has not been heretofore recognized is that it is the active state of the receptor that is most useful for discovering agonists, partial agonists, and inverse agonists of the receptor. For those diseases which result from an overly active receptor or an under-active receptor, what is desired in a therapeutic drug is a compound which acts to diminish the active state of a receptor or enhance the activity of the receptor, respectively, not necessarily a drug which is an antagonist to the endogenous ligand. This is because a compound that reduces or enhances the activity of the active receptor state need not bind at the same site as the endogenous ligand. Thus, as taught by a method of this invention, any search for therapeutic compounds should start by screening compounds against the ligand-independent active state.

Screening candidate compounds against non-endogenous, constitutively activated GPCRs allows for the direct identification of candidate compounds which act at these cell surface receptors, without requiring any prior knowledge or use of the receptor's endogenous ligand. By determining areas within the body where the endogenous version of such GPCRs are expressed and/or over-expressed, it is possible to determine related disease/disorder states which are associated with the expression and/or over-expression of these receptors; such an approach is disclosed in this patent document.

- 20 -

B. Disease/Disorder Identification and/or Selection

Most preferably, inverse agonists to the non-endogenous, constitutively activated GPCRs can be identified using the materials of this invention. Such inverse agonists are ideal candidates as lead compounds in drug discovery programs for treating diseases related to these receptors.

- 5 Because of the ability to directly identify inverse agonists, partial agonists or agonists to these receptors, thereby allowing for the development of pharmaceutical compositions, a search, for diseases and disorders associated with these receptors is possible. For example, scanning both diseased and normal tissue samples for the presence of these receptor now becomes more than an academic exercise or one which might be pursued along the path of identifying, in the case of an
- 10 orphan receptor, an endogenous ligand. Tissue scans can be conducted across a broad range of healthy and diseased tissues. Such tissue scans provide a preferred first step in associating a specific receptor with a disease and/or disorder.

Preferably, the DNA sequence of the endogenous GPCR is used to make a probe for either radiolabeled cDNA or RT-PCR identification of the expression of the GPCR in tissue samples.

- 15 The presence of a receptor in a diseased tissue, or the presence of the receptor at elevated or decreased concentrations in diseased tissue compared to a normal tissue, can be preferably utilized to identify a correlation with that disease. Receptors can equally well be localized to regions of organs by this technique. Based on the known functions of the specific tissues to which the receptor is localized, the putative functional role of the receptor can be deduced.

20 **C. A "Human GPCR Proline Marker" Algorithm and the Creation of Non-Endogenous, Constitutively-Active Human GPCRs**

Among the many challenges facing the biotechnology arts is the unpredictability in gleaning genetic information from one species and correlating that information to another species

- 21 -

- nowhere in this art does this problem evidence more annoying exacerbation than in the genetic sequences that encode nucleic acids and proteins. Thus, for consistency and because of the highly unpredictable nature of this art, the following invention is limited, in terms of mammals, to human GPCRs - applicability of this invention to other mammalian species, while a potential possibility, is considered beyond mere rote application.

In general, when attempting to apply common "rules" from one related protein sequence to another or from one species to another, the art has typically resorted to sequence alignment, *i.e.*, sequences are linearized and attempts are then made to find regions of commonality between two or more sequences. While useful, this approach does not always prove to result in meaningful information. In the case of GPCRs, while the general structural motif is identical for all GPCRs, the variations in lengths of the TMs, ECs and ICs make such alignment approaches from one GPCR to another difficult at best. Thus, while it may be desirable to apply a consistent approach to, *e.g.*, constitutive activation from one GPCR to another, because of the great diversity in sequence length, fidelity, etc from one GPCR to the next, a generally applicable, and readily successful mutational alignment approach is in essence not possible. In an analogy, such an approach is akin to having a traveler start a journey at point A by giving the traveler dozens of different maps to point B, without any scale or distance markers on any of the maps, and then asking the traveler to find the shortest and most efficient route to destination B only by using the maps. In such a situation, the task can be readily simplified by having (a) a common "place-marker" on each map, and (b) the ability to measure the distance from the place-marker to destination B - this, then, will allow the traveler to select the most efficient from starting-point A to destination B.

In essence, a feature of the invention is to provide such coordinates within human GPCRs

- 22 -

that readily allows for creation of a constitutively active form of the human GPCRs.

As those in the art appreciate, the transmembrane region of a cell is highly hydrophobic; thus, using standard hydrophobicity plotting techniques, those in the art are readily able to determine the TM regions of a GPCR, and specifically TM6 (this same approach is also applicable to determining the EC and IC regions of the GPCR). It has been discovered that within the TM6 region of human GPCRs, a common proline residue (generally near the middle of TM6), acts as a constitutive activation "marker." By counting 15 amino acids from the proline marker, the 16th amino acid (which is located in the IC3 loop), when mutated from its endogenous form to a non-endogenous form, leads to constitutive activation of the receptor. For convenience, we refer to this as the "Human GPCR Proline Marker" Algorithm. Although the non-endogenous amino acid at this position can be any of the amino acids, most preferably, the non-endogenous amino acid is lysine. While not wishing to be bound by any theory, we believe that this position itself is unique and that the mutation at this location impacts the receptor to allow for constitutive activation.

We note that, for example, when the endogenous amino acid at the 16th position is already lysine (as is the case with GPR4 and GPR32), then in order for X to be a non-endogenous amino acid, it must be other than lysine; thus, in those situations where the endogenous GPCR has an endogenous lysine residue at the 16th position, the non-endogenous version of that GPCR preferably incorporates an amino acid other than lysine, preferably alanine, histidine and arginine, at this position. Of further note, it has been determined that GPR4 appears to be linked to Gs and active in its endogenous form (data not shown).

Because there are only 20 naturally occurring amino acids (although the use of non-naturally occurring amino acids is also viable), selection of a particular non-endogenous amino

- 23 -

acid for substitution at this 16th position is viable and allows for efficient selection of a non-endogenous amino acid that fits the needs of the investigator. However, as noted, the more preferred non-endogenous amino acids at the 16th position are lysine, histidine, arginine and alanine, with lysine being most preferred. Those of ordinary skill in the art are credited with the ability to readily determine proficient methods for changing the sequence of a codon to achieve a desired mutation.

It has also been discovered that occasionally, but not always, the proline residue marker will be preceded in TM6 by W2 (*i.e.*, W2P¹AA₁₇X) where W is tryptophan and 2 is any amino acid residue.

Our discovery, amongst other things, negates the need for unpredictable and complicated sequence alignment approaches commonly used by the art. Indeed, the strength of our discovery, while an algorithm in nature, is that it can be applied in a facile manner to human GPCRs, with dexterous simplicity by those in the art, to achieve a unique and highly useful end-product, *i.e.*, a constitutively activated version of a human GPCR. Because many years and significant amounts of money will be required to determine the endogenous ligands for the human GPCRs that the Human Genome project is uncovering, the disclosed invention not only reduces the time necessary to positively exploit this sequence information, but at significant cost-savings. This approach truly validates the importance of the Human Genome Project because it allows for the utilization of genetic information to not only understand the role of the GPCRs in, *e.g.*, diseases, but also provides the opportunity to improve the human condition.

D. Screening of Candidate Compounds

1. Generic GPCR screening assay techniques

When a G protein receptor becomes constitutively active, it couples to a G protein (*e.g.*,

- 24 -

Gq, Gs, Gi, Go) and stimulates release and subsequent binding of GTP to the G protein. The G protein then acts as a GTPase and slowly hydrolyzes the GTP to GDP, whereby the receptor, under normal conditions, becomes deactivated. However, constitutively activated receptors, including the non-endogenous, human constitutively active GPCRs of the present invention, continue to exchange GDP for GTP. A non-hydrolyzable analog of GTP, [³⁵S]GTPγS, can be used to monitor enhanced binding to G proteins present on membranes which express constitutively activated receptors. It is reported that [³⁵S]GTPγS can be used to monitor G protein coupling to membranes in the absence and presence of ligand. An example of this monitoring, among other examples well-known and available to those in the art, was reported by Traynor and Nahorski in 1995. The preferred use of this assay system is for initial screening of candidate compounds because the system is generically applicable to all G protein-coupled receptors regardless of the particular G protein that interacts with the intracellular domain of the receptor.

B 2. Specific GPCR screening assay techniques

C Once candidate compounds are identified using the "generic" G protein-coupled receptor assay (*i.e.*, an assay to select compounds that are agonists, partial agonists, or inverse agonists), further screening to confirm that the compounds have interacted at the receptor site is preferred. For example, a compound identified by the "generic" assay may not bind to the receptor, but may instead merely "uncouple" the G protein from the intracellular domain.

a. Gs and Gi.

Gs stimulates the enzyme adenylyl cyclase. Gi (and Go), on the other hand, inhibit this enzyme. Adenylyl cyclase catalyzes the conversion of ATP to cAMP; thus,

- 25 -

constitutively activated GPCRs that couple the Gs protein are associated with increased cellular levels of cAMP. On the other hand, constitutively activated GPCRs that couple the Gi (or Go) protein are associated with decreased cellular levels of cAMP. *See, generally, "Indirect Mechanisms of Synaptic Transmission," Chpt. 8, From Neuron To Brain (3rd Ed.)*

- 5 Nichols, J.G. et al eds. Sinauer Associates, Inc. (1992). Thus, assays that detect cAMP can be utilized to determine if a candidate compound is, *e.g.*, an inverse agonist to the receptor (*i.e.*, such a compound would decrease the levels of cAMP). A variety of approaches known in the art for measuring cAMP can be utilized; a most preferred approach relies upon the use of anti-cAMP antibodies in an ELISA-based format. Another type of assay that can be
- 10 utilized is a whole cell second messenger reporter system assay. Promoters on genes drive the expression of the proteins that a particular gene encodes. Cyclic AMP drives gene expression by promoting the binding of a cAMP-responsive DNA binding protein or transcription factor (CREB) which then binds to the promoter at specific sites called cAMP response elements and drives the expression of the gene. Reporter systems can be constructed which have a promoter containing
- 15 multiple cAMP response elements before the reporter gene, *e.g.*, β -galactosidase or luciferase. Thus, a constitutively activated Gs-linked receptor causes the accumulation of cAMP that then activates the gene and expression of the reporter protein. The reporter protein such as β -galactosidase or luciferase can then be detected using standard biochemical assays (Chen et al. 1995). With respect to GPCRs that link to Gi (or Go), and thus decrease levels of cAMP, an
- 20 approach to the screening of, *e.g.*, inverse agonists, based upon utilization of receptors that link to Gs (and thus increase levels of cAMP) is disclosed in the Example section with respect to GPR17 and GPR30.

- 26 -

b. Go and Gq.

Gq and Go are associated with activation of the enzyme phospholipase C, which in turn hydrolyzes the phospholipid PIP_2 , releasing two intracellular messengers: diacylglycerol (DAG) and inositol 1,4,5-trisphosphate (IP_3). Increased accumulation of IP_3 is associated with activation of Gq- and Go-associated receptors. *See, generally, "Indirect Mechanisms of Synaptic Transmission," Chpt. 8, From Neuron To Brain (3rd Ed.) Nichols, J.G. et al eds. Sinauer Associates, Inc. (1992).* Assays that detect IP_3 accumulation can be utilized to determine if a candidate compound is, *e.g.*, an inverse agonist to a Gq- or Go-associated receptor (*i.e.*, such a compound would decrease the levels of IP_3). Gq-associated receptors can also be examined using an AP1 reporter assay in that Gq-dependent phospholipase C causes activation of genes containing AP1 elements; thus, activated Gq-associated receptors will evidence an increase in the expression of such genes, whereby inverse agonists thereto will evidence a decrease in such expression, and agonists will evidence an increase in such expression. Commercially available assays for such detection are available.

E. Medicinal Chemistry

Generally, but not always, direct identification of candidate compounds is preferably conducted in conjunction with compounds generated via combinatorial chemistry techniques, whereby thousands of compounds are randomly prepared for such analysis. Generally, the results of such screening will be compounds having unique core structures; thereafter, these compounds are preferably subjected to additional chemical modification around a preferred core structure(s) to further enhance the medicinal properties thereof. Such techniques are

- 27 -

known to those in the art and will not be addressed in detail in this patent document.

F. Pharmaceutical Compositions

Candidate compounds selected for further development can be formulated into pharmaceutical compositions using techniques well known to those in the art. Suitable
5 pharmaceutically-acceptable carriers are available to those in the art; for example, *see* Remington's Pharmaceutical Sciences, 16th Edition, 1980, Mack Publishing Co., (Oslo et al., eds.)

G. Other Utility

Although a preferred use of the non-endogenous versions of the disclosed human GPCRs is for the direct identification of candidate compounds as inverse agonists, agonists or partial
10 agonists (preferably for use as pharmaceutical agents), these receptors can also be utilized in research settings. For example, in vitro and in vivo systems incorporating these receptors can be utilized to further elucidate and understand the roles of the receptors in the human condition, both normal and diseased, as well understanding the role of constitutive activation as it applies to understanding the signaling cascade. A value in these non-endogenous receptors is that their
15 utility as a research tool is enhanced in that, because of their unique features, the disclosed receptors can be used to understand the role of a particular receptor in the human body before the endogenous ligand therefor is identified. Other uses of the disclosed receptors will become apparent to those in the art based upon, *inter alia*, a review of this patent document.

EXAMPLES

20 The following examples are presented for purposes of elucidation, and not limitation, of the present invention. Following the teaching of this patent document that a mutational cassette may be utilized in the IC3 loop of human GPCRs based upon a position relative to a proline residue in TM6 to constitutively activate the receptor, and while specific nucleic acid

- 28 -

and amino acid sequences are disclosed herein, those of ordinary skill in the art are credited with the ability to make minor modifications to these sequences while achieving the same or substantially similar results reported below. Particular approaches to sequence mutations are within the purview of the artisan based upon the particular needs of the artisan.

5 Example 1
Preparation of Endogenous Human GPCRs

A variety of GPCRs were utilized in the Examples to follow. Some endogenous human GPCRs were graciously provided in expression vectors (as acknowledged below) and other endogenous human GPCRs were synthesized *de novo* using publicly-available sequence
10 information.

1. GPR1 (GenBank Accession Number: U13666)

The human cDNA sequence for GPR1 was provided in pRcCMV by Brian O'Dowd (University of Toronto). GPR1 cDNA (1.4kB fragment) was excised from the pRcCMV vector as a NdeI-XbaI fragment and was subcloned into the NdeI-XbaI site of pCMV vector (*see*
15 Figure 3). Nucleic acid (SEQ.ID.NO.: 1) and amino acid (SEQ.ID.NO.: 2) sequences for human GPR1 were thereafter determined and verified.

2. GPR4 (GenBank Accession Numbers: L36148, U35399, U21051)

The human cDNA sequence for GPR4 was provided in pRcCMV by Brian O'Dowd (University of Toronto). GPR1 cDNA (1.4kB fragment) was excised from the pRcCMV
20 vector as an ApaI(blunted)-XbaI fragment and was subcloned (with most of the 5' untranslated region removed) into HindIII(blunted)-XbaI site of pCMV vector. Nucleic acid (SEQ.ID.NO.: 3) and amino acid (SEQ.ID.NO.: 4) sequences for human GPR4 were thereafter determined and verified.

3. GPR5 (GenBank Accession Number: L36149)

- 29 -

The cDNA for human GPR5 was generated and cloned into pCMV expression vector as follows: PCR was performed using genomic DNA as template and rTth polymerase (Perkin Elmer) with the buffer system provided by the manufacturer, 0.25 μ M of each primer, and 0.2 mM of each of the 4 nucleotides. The cycle condition was 30 cycles of: 94°C for 1 min; 64°C for 1min; and 72°C for 1.5 min. The 5' PCR primer contained an EcoRI site with the sequence: 5'-TATGAATTCAGATGCTCTAAACGTCCCTGC-3' (SEQ.ID.NO.: 5)

and the 3' primer contained BamHI site with the sequence:

5'-TCCGGATCCACCTGCACCTGCGCCTGCACC-3' (SEQ.ID.NO.: 6).

The 1.1 kb PCR fragment was digested with EcoRI and BamHI and cloned into EcoRI-BamHI site of PCMV expression vector. Nucleic acid (SEQ.ID.NO.: 7) and amino acid (SEQ.ID.NO.: 8) sequences for human GPR5 were thereafter determined and verified.

4. GPR7 (GenBank Accession Number: U22491)

The cDNA for human GPR7 was generated and cloned into pCMV expression vector as follows: PCR condition- PCR was performed using genomic DNA as template and rTth polymerase (Perkin Elmer) with the buffer system provided by the manufacturer, 0.25 μ M of each primer, and 0.2 mM of each of the 4 nucleotides. The cycle condition was 30 cycles of: 94°C for 1 min; 62°C for 1min; and 72°C for 1min and 20 sec. The 5' PCR primer contained a HindIII site with the sequence:

5'-GCAAGCTTGGGGACGCCAGGTCGCCGGCT-3' (SEQ.ID.NO.: 9)

and the 3' primer contained a BamHI site with the sequence:

5'-GCGGATCCGGACGCTGGGGGAGTCAGGCTGC-3' (SEQ.ID.NO.: 10).

The 1.1 kb PCR fragment was digested with HindIII and BamHI and cloned into HindIII-BamHI site of pCMV expression vector. Nucleic acid (SEQ.ID.NO.: 11) and amino acid (SEQ.ID.NO.:

- 30 -

12) sequences for human GPR7 were thereafter determined and verified.

5. GPR8 (GenBank Accession Number: U22492)

The cDNA for human GPR8 was generated and cloned into pCMV expression vector as follows: PCR was performed using genomic DNA as template and rTth polymerase (Perkin Elmer) with the buffer system provided by the manufacturer, 0.25 μ M of each primer, and 0.2 mM of each of the 4 nucleotides. The cycle condition was 30 cycles of: 94°C for 1 min; 62°C for 1 min; and 72°C for 1 min and 20 sec. The 5' PCR primer contained an EcoRI site with the sequence:

5'-CGGAATTCGTCACCGTCCCAGCTACAATG-3' (SEQ.ID.NO.: 13).

10 and the 3' primer contained a BamHI site with the sequence:

5'-ATGGATCCCAGGCCCTTCAGCACCGCAATAT-3' (SEQ.ID.NO.: 14).

The 1.1 kb PCR fragment was digested with EcoRI and BamHI and cloned into EcoRI-BamHI site of pCMV expression vector. All 4 cDNA clones sequenced contained a possible polymorphism involving a change of amino acid 206 from Arg to Gln. Aside from this difference, nucleic acid (SEQ.ID.NO.: 15) and amino acid (SEQ.ID.NO.: 16) sequences for human GPR8 were thereafter determined and verified.

6. GPR9 (GenBank Accession Number: X95876)

The cDNA for human GPR9 was generated and cloned into pCMV expression vector as follows: PCR was performed using a clone (provided by Brian O'Dowd) as template and pfu polymerase (Stratagene) with the buffer system provided by the manufacturer supplemented with 10% DMSO, 0.25 μ M of each primer, and 0.5 mM of each of the 4 nucleotides. The cycle condition was 25 cycles of: 94°C for 1 min; 56°C for 1 min; and 72°C for 2.5 min. The 5' PCR primer contained an EcoRI site with the sequence:

- 31 -

5'-ACGAATTCAGCCATGGTCCTTGAGGTGAGTGACCACCAAGTGCTAAAT-3'
(SEQ.ID.NO.: 17)

and the 3' primer contained a BamHI site with the sequence:

5'-GAGGATCCTGGAATGCGGGAAGTCAG-3' (SEQ.ID.NO.: 18).

- 5 The 1.2 kb PCR fragment was digested with EcoRI and cloned into EcoRI-SmaI site of PCMV expression vector. Nucleic acid (SEQ.ID.NO.: 19) and amino acid (SEQ.ID.NO.: 20) sequences for human GPR9 were thereafter determined and verified.

7. GPR9-6 (GenBank Accession Number: U45982)

The cDNA for human GPR9-6 was generated and cloned into pCMV expression

- 10 vector as follows: PCR was performed using genomic DNA as template and rTth polymerase (Perkin Elmer) with the buffer system provided by the manufacturer, 0.25 μ M of each primer, and 0.2 mM of each of the 4 nucleotides. The cycle condition was 30 cycles of: 94°C for 1 min; 62°C for 1min; and 72°C for 1 min and 20 sec. The 5' PCR primer was kinased with the sequence:

5'-TTAAGCTTGACCTAATGCCATCTTGTGTCC-3' (SEQ.ID.NO.: 21)

- 15 and the 3' primer contained a BamHI site with the sequence:

5'-TTGGATCCAAAAGAACCATGCACCTCAGAG-3' (SEQ.ID.NO.: 22).

The 1.2 kb PCR fragment was digested with BamHI and cloned into EcoRV-BamHI site of pCMV expression vector. Nucleic acid (SEQ.ID.NO.: 23) and amino acid (SEQ.ID.NO.: 24) sequences for human GPR9-6 were thereafter determined and verified.

20 **8. GPR10 (GenBank Accession Number: U32672)**

The human cDNA sequence for GPR10 was provided in pRcCMV by Brian O'Dowd (University of Toronto). GPR10 cDNA (1.3kb fragment) was excised from the pRcCMV vector as an EcoRI-XbaI fragment and was subcloned into EcoRI-XbaI site of pCMV

- 32 -

vector. Nucleic acid (SEQ.ID.NO.: 25) and amino acid (SEQ.ID.NO.: 26) sequences for human GPR10 were thereafter determined and verified.

9. GPR15 (GenBank Accession Number: U34806)

The human cDNA sequence for GPR15 was provided in pCDNA3 by Brian O'Dowd (University of Toronto). GPR15 cDNA (1.5kB fragment) was excised from the pCDNA3 vector as a HindIII-Bam fragment and was subcloned into HindIII-Bam site of pCMV vector. Nucleic acid (SEQ.ID.NO.: 27) and amino acid (SEQ.ID.NO.: 28) sequences for human GPR15 were thereafter determined and verified.

10. GPR17 (GenBank Accession Number: Z94154)

The cDNA for human GPR17 was generated and cloned into pCMV expression vector as follows: PCR was performed using genomic DNA as template and rTth polymerase (Perkin Elmer) with the buffer system provided by the manufacturer, 0.25 μ M of each primer, and 0.2 mM of each 4 nucleotides. The cycle condition was 30 cycles of: 94°C for 1 min; 56°C for 1min and 72 °C for 1 min and 20 sec. The 5' PCR primer contained an EcoRI site with the sequence:

5'-CTAGAATTCTGACTCCAGCCAAAGCATGAAT-3' (SEQ.ID.NO.: 29) and the 3' primer contained a BamHI site with the sequence:

5'-GCTGGATCCTAAACAGTCTGCGCTCGGCCT-3' (SEQ.ID.NO.: 30).

The 1.1 kb PCR fragment was digested with EcoRI and BamHI and cloned into EcoRI-BamHI site of pCMV expression vector. Nucleic acid (SEQ.ID.NO.: 31) and amino acid (SEQ.ID.NO.: 32) sequences for human GPR17 were thereafter determined and verified.

11. GPR18 (GenBank Accession Number: L42324)

The cDNA for human GPR18 was generated and cloned into pCMV expression

- 33 -

vector as follows: PCR was performed using genomic DNA as template and rTth polymerase (Perkin Elmer) with the buffer system provided by the manufacturer, 0.25 μ M of each primer, and 0.2 mM of each of the 4 nucleotides. The cycle condition was 30 cycles of: 94°C for 1 min; 54°C for 1min; and 72°C for 1min and 20 sec. The 5' PCR primer was kinased with the sequence:

5'-ATAAGATGATCACCTGAACAATCAAGAT-3' (SEQ.ID.NO.: 33)

and the 3' primer contained an EcoRI site with the sequence:

5'-TCCGAATTCATAACATTTCACTGTTTATATTGC-3' (SEQ.ID.NO.: 34).

The 1.0 kb PCR fragment was digested with EcoRI and cloned into blunt-EcoRI site of pCMV expression vector. All 8 cDNA clones sequenced contained 4 possible polymorphisms involving changes of amino acid 12 from Thr to Pro, amino acid 86 from Ala to Glu, amino acid 97 from Ile to Leu and amino acid 310 from Leu to Met. Aside from these changes, nucleic acid (SEQ.ID.NO.: 35) and amino acid (SEQ.ID.NO.: 36) sequences for human GPR18 were thereafter determined and verified.

12. GPR20 (GenBank Accession Number: U66579)

The cDNA for human GPR20 was generated and cloned into pCMV expression vector as follows: PCR was performed using genomic DNA as template and rTth polymerase (Perkin Elmer) with the buffer system provided by the manufacturer, 0.25 μ M of each primer, and 0.2 mM of each of the 4 nucleotides. The cycle condition was 30 cycles of: 94°C for 1 min; 62°C for 1min; and 72°C for 1 min and 20 sec. The 5' PCR primer was kinased with the sequence:

5'-CCAAGCTTCCAGGCCTGGGGTGTGCTGG-3' (SEQ.ID.NO.: 37)

and the 3' primer contained a BamHI site with the sequence:

5'-ATGGATCCTGACCTTCGGCCCCTGGCAGA-3' (SEQ.ID.NO.: 38).

The 1.2 kb PCR fragment was digested with BamHI and cloned into EcoRV-BamHI site of

- 34 -

PCMV expression vector. Nucleic acid (SEQ.ID.NO.: 39) and amino acid (SEQ.ID.NO.: 40) sequences for human GPR20 were thereafter determined and verified.

13. GPR21 (GenBank Accession Number: U66580)

The cDNA for human GPR21 was generated and cloned into pCMV expression
5 vector as follows: PCR was performed using genomic DNA as template and rTth polymerase (Perkin Elmer) with the buffer system provided by the manufacturer, 0.25 μ M of each primer, and 0.2 mM of each of the 4 nucleotides. The cycle condition was 30 cycles of: 94°C for 1 min; 62°C for 1min; and 72°C for 1 min and 20 sec. The 5' PCR primer was kinased with the sequence:
5'-GAGAATTCACTCTGAGCTCAAGATGAACT-3' (SEQ.ID.NO.: 41)

10 and the 3' primer contained a BamHI site with the sequence:

5'-CGGGATCCCCGTAAGTCTGAGCCACTTCAGAT-3' (SEQ.ID.NO.: 42).

The 1.1 kb PCR fragment was digested with BamHI and cloned into EcoRV-BamHI site of pCMV expression vector. Nucleic acid (SEQ.ID.NO.: 43) and amino acid (SEQ.ID.NO.: 44) sequences for human GPR21 were thereafter determined and verified.

15 14. GPR22 (GenBank Accession Number: U66581)

The cDNA for human GPR22 was generated and cloned into pCMV expression
vector as follows: PCR was performed using genomic DNA as template and rTth polymerase (Perkin Elmer) with the buffer system provided by the manufacturer, 0.25 μ M of each primer, and 0.2 mM of each of the 4 nucleotides. The cycle condition was 30 cycles of: 94°C for 1 min; 50°C
20 for 1min; and 72°C for 1.5 min. The 5' PCR primer was kinased with the sequence:

5'-TCCCCCGGAAAAAACCAACTGCTCCAAA-3' (SEQ.ID.NO.: 45)

and the 3' primer contained a BamHI site with the sequence:

5'-TAGGATCCATTGGAATGTGGATTGGTGAAA-3' (SEQ.ID.NO.: 46).

- 35 -

The 1.38 kb PCR fragment was digested with BamHI and cloned into EcoRV-BamHI site of pCMV expression vector. Nucleic acid (SEQ.ID.NO.: 47) and amino acid (SEQ.ID.NO.: 48) sequences for human GPR22 were thereafter determined and verified.

15. GPR24 (GenBank Accession Number: U71092)

5 The cDNA for human GPR24 was generated and cloned into pCMV expression vector as follows: PCR was performed using genomic DNA as template and rTth polymerase (Perkin Elmer) with the buffer system provided by the manufacturer, 0.25 μ M of each primer, and 0.2 mM of each 4 nucleotides. The cycle condition was 30 cycles of: 94°C for 1 min; 56°C for 1min; and 72 °C for 1 min and 20 sec. The 5' PCR primer contains a HindIII site with the
10 sequence:

5'-GTGAAGCTTGCCTCTGGTGCCTGCAGGAGG-3' (SEQ.ID.NO.: 49)

and the 3' primer contains an EcoRI site with the sequence:

5'-GCAGAATTCCCGTGGCGTGTGTGGTGCCC-3' (SEQ.ID.NO.: 50).

The 1.3 kb PCR fragment was digested with HindIII and EcoRI and cloned into HindIII-EcoRI
15 site of pCMV expression vector. The nucleic acid (SEQ.ID.NO.: 51) and amino acid sequence (SEQ.ID.NO.: 52) for human GPR24 were thereafter determined and verified.

16. GPR30 (GenBank Accession Number: U63917)

The cDNA for human GPR30 was generated and cloned as follows: the coding sequence of GPR30 (1128bp in length) was amplified from genomic DNA using the primers:

20 5'-GGCGGATCCATGGATGTGACTTCCCAA-3' (SEQ.ID.NO.: 53) and

5'-GGCGGATCCCTACACGGCACTGCTGAA-3' (SEQ.ID.NO.: 54).

The amplified product was then cloned into a commercially available vector, pCR2.1 (Invitrogen).

- 36 -

using a "TOPO-TA Cloning Kit" (Invitrogen, #K4500-01), following manufacturer instructions.

The full-length GPR30 insert was liberated by digestion with BamHI, separated from the vector by agarose gel electrophoresis, and purified using a Sephaglas Bandprep™ Kit (Pharmacia, # 27-9285-01) following manufacturer instructions. The nucleic acid (SEQ.ID.NO.: 55) and amino acid

5 sequence (SEQ.ID.NO.: 56) for human GPR30 were thereafter determined and verified.

17. GPR31 (GenBank Accession Number: U65402)

The cDNA for human GPR31 was generated and cloned into pCMV expression vector as follows: PCR was performed using genomic DNA as template and rTth polymerase (Perkin Elmer) with the buffer system provided by the manufacturer, 0.25 μM of each primer, and

10 0.2 mM of each of the 4 nucleotides. The cycle condition was 30 cycles of: 94°C for 1 min; 58°C for 1min; and 72°C for 2 min. The 5' PCR primer contained an EcoRI site with the sequence:

5'-AAGGAATTCACGGCCGGGTGATGCCATTCCC-3' (SEQ.ID.NO.: 57)

and the 3' primer contained a BamHI site with the sequence:

5'-GGTGGATCCATAAACACGGGCGTTGAGGAC-3' (SEQ.ID.NO.: 58).

15 The 1.0 kb PCR fragment was digested with EcoRI and BamHI and cloned into EcoRI-BamHI site of pCMV expression vector. Nucleic acid (SEQ.ID.NO.: 59) and amino acid (SEQ.ID.NO.: 60) sequences for human GPR31 were thereafter determined and verified.

18. GPR32 (GenBank Accession Number: AF045764)

The cDNA for human GPR32 was generated and cloned into pCMV expression vector as follows: PCR was performed using genomic DNA as template and rTth polymerase (Perkin Elmer) with the buffer system provided by the manufacturer, 0.25 μM of each primer, and

20 0.2 mM of each 4 nucleotides. The cycle condition was 30 cycles of: 94°C for 1 min; 56°C for 1min; and 72 °C for 1 min and 20 sec. The 5' PCR primer contained an EcoRI site with the

- 37 -

sequence:

5'-TAAGAATTCCATAAAAAATTATGGAATGG-3' (SEQ.ID.NO.:243)

and the 3' primer contained a BamHI site with the sequence:

5'-CCAGGATCCAGCTGAAGTCTCCATCATTC-3' (SEQ.ID.NO.: 244).

- 5 The 1.1 kb PCR fragment was digested with EcoRI and BamHI and cloned into EcoRI-BamHI site of pCMV expression vector. Nucleic acid (SEQ.ID.NO.: 245) and amino acid (SEQ.ID.NO.: 246) sequences for human GPR32 were thereafter determined and verified.

19. GPR40 (GenBank Accession Number: AF024687)

The cDNA for human GPR40 was generated and cloned into pCMV expression

- 10 vector as follows: PCR was performed using genomic DNA as template and rTth polymerase (Perkin Elmer) with the buffer system provided by the manufacturer, 0.25 μ M of each primer, and 0.2 mM of each 4 nucleotides. The cycle condition was 30 cycles of: 94°C for 1 min, 65°C for 1min and 72 °C for 1 min and 10 sec. The 5' PCR primer contained an EcoRI site with the sequence

- 15 5'-GCAGAATTCGGCGGCCCATGGACCTGCCCC-3' (SEQ.ID.NO.: 247)

and the 3' primer contained a BamHI site with the sequence

5'-GCTGGATCCCCGAGCAGTGGCGTTACTTC-3' (SEQ.ID.NO.: 248).

The 1 kb PCR fragment was digested with EcoRI and BamHI and cloned into EcoRI-BamHI site of pCMV expression vector. Nucleic acid (SEQ.ID.NO.: 249) and amino acid (SEQ.ID.NO.: 250)

- 20 sequences for human GPR40 were thereafter determined and verified.

20. GPR41 (GenBank Accession Number AF024688)

The cDNA for human GPR41 was generated and cloned into pCMV expression vector as follows: PCR was performed using genomic DNA as template and rTth polymerase

- 38 -

(Perkin Elmer) with the buffer system provided by the manufacturer, 0.25 μ M of each primer, and 0.2 mM of each 4 nucleotides. The cycle condition was 30 cycles of 94°C for 1 min, 65°C for 1min and 72 °C for 1 min and 10 sec. The 5' PCR primer contained an HindIII site with the sequence:

5 5'-CTCAAGCTTACTCTCTCTCACCAGTGGCCAC-3' (SEQ.ID.NO.: 251)

and the 3' primer was kinased with the sequence

5'-CCCTCCTCCCCGGAGGACCTAGC-3' (SEQ.ID.NO.: 252).

The 1 kb PCR fragment was digested with HindIII and cloned into HindIII-blunt site of pCMV expression vector. Nucleic acid (SEQ.ID.NO.: 253) and amino acid (SEQ.ID.NO.: 254)

10 sequences for human GPR41 were thereafter determined and verified.

21. GPR43 (GenBank Accession Number AF024690)

The cDNA for human GPR43 was generated and cloned into pCMV expression vector as follows: PCR was performed using genomic DNA as template and rTth polymerase (Perkin Elmer) with the buffer system provided by the manufacturer, 0.25 μ M of each primer, and 0.2 mM of each 4 nucleotides. The cycle condition was 30 cycles of: 94°C for 1 min; 65°C for 1min; and 72 °C for 1 min and 10 sec. The 5' PCR primer contains an HindIII site with the sequence:

15 5'-TTTAAGCTTCCCCCTCCAGGATGCTGCCGGAC-3' (SEQ.ID.NO.: 255)

and the 3' primer contained an EcoRI site with the sequence:

20 5'-GGCGAATTCTGAAGGTCCAGGGAACTGCTA-3' (SEQ.ID.NO. 256).

The 1 kb PCR fragment was digested with HindIII and EcoRI and cloned into HindIII-EcoRI site of pCMV expression vector. Nucleic acid (SEQ.ID.NO.: 257) and amino acid (SEQ.ID.NO.: 258) sequences for human GPR43 were thereafter determined and verified.

- 39 -

22. APJ (GenBank Accession Number: U03642)

Human APJ cDNA (in pRcCMV vector) was provided by Brian O'Dowd (University of Toronto). The human APJ cDNA was excised from the pRcCMV vector as an EcoRI-XbaI (blunted) fragment and was subcloned into EcoRI-SmaI site of pCMV vector.

- 5 Nucleic acid (SEQ.ID.NO.: 61) and amino acid (SEQ.ID.NO.: 62) sequences for human APJ were thereafter determined and verified.

23. BLR1 (GenBank Accession Number: X68149)

- The cDNA for human BLR1 was generated and cloned into pCMV expression vector as follows: PCR was performed using thymus cDNA as template and rTth polymerase (Perkin Elmer) with the buffer system provided by the manufacturer, 0.25 μ M of each primer, and 0.2 mM of each of the 4 nucleotides. The cycle condition was 30 cycles of: 94°C for 1 min; 62°C for 1min; and 72°C for 1 min and 20 sec. The 5' PCR primer contained an EcoRI site with the sequence:

5'-TGAGAATTCTGGTGA CTACAGCCGGCACAG-3' (SEQ.ID.NO.: 63);

- 15 and the 3' primer contained a BamHI site with the sequence:

5'-GCCGGATCCAAGGAAAAGCAGCAATAAAAGG-3' (SEQ.ID.NO.: 64). The 1.2 kb PCR fragment was digested with EcoRI and BamHI and cloned into EcoRI-BamHI site of pCMV expression vector. Nucleic acid (SEQ.ID.NO.: 65) and amino acid (SEQ.ID.NO.: 66) sequences for human BLR1 were thereafter determined and verified.

24. CEPR (GenBank Accession Number: U77827)

20 The cDNA for human CEPR was generated and cloned into pCMV expression vector as follows: PCR was performed using genomic DNA as template and rTth polymerase (Perkin Elmer) with the buffer system provided by the manufacturer, 0.25 μ M of each primer, and

- 40 -

0.2 mM of each of the 4 nucleotides. The cycle condition was 30 cycles of: 94°C for 1 min; 65°C for 1min; and 72°C for 1 min and 20 sec. The 5' PCR primer was kinased with the sequence:

5'-CAAAGCTTGAAGCTGCACGGTGCAGAGAC-3' (SEQ.ID.NO.:67)

and the 3' primer contained a BamHI site with the sequence:

5'-GCGGATCCCGAGTCACACCTGGCTGGGCC-3' (SEQ.ID.NO.: 68).

The 1.2 kb PCR fragment was digested with BamHI and cloned into EcoRV-BamHI site of pCMV expression vector. Nucleic acid (SEQ.ID.NO.: 69) and amino acid (SEQ.ID.NO.: 70) sequences for human CEPR were thereafter determined and verified.

25. EB11 (GenBank Accession Number: L31581)

The cDNA for human EB11 was generated and cloned into pCMV expression vector as follows: PCR was performed using thymus cDNA as template and rTth polymerase (Perkin Elmer) with the buffer system provided by the manufacturer, 0.25 µM of each primer, and 0.2 mM of each of the 4 nucleotides. The cycle condition was 30 cycles of: 94°C for 1 min; 62°C for 1min; and 72°C for 1 min and 20 sec. The 5' PCR primer contained an EcoRI site with the sequence:

5'-ACAGAATTCCTGTGTGGTTTACCGCCCAG-3' (SEQ.ID.NO.: 71)

and the 3' primer contained a BamHI site with the sequence:

5'-CTCGGATCCAGGCAGAAGAGTCGCCTATGG-3' (SEQ.ID.NO.: 72).

The 1.2 kb PCR fragment was digested with EcoRI and BamHI and cloned into EcoRI-BamHI site of pCMV expression vector. Nucleic acid (SEQ.ID.NO.: 73) and amino acid (SEQ.ID.NO.: 74) sequences for human EB11 were thereafter determined and verified.

26. EB12 (GenBank Accession Number: L08177)

The cDNA for human EB12 was generated and cloned into pCMV expression

- 41 -

vector as follows: PCR was performed using cDNA clone (graciously provided by Kevin Lynch, University of Virginia Health Sciences Center; the vector utilized was not identified by the source) as template and pfu polymerase (Stratagene) with the buffer system provided by the manufacturer supplemented with 10% DMSO, 0.25 μ M of each primer, and 0.5 mM of each of the 4 nucleotides. The cycle condition was 30 cycles of: 94°C for 1 min; 60°C for 1min; and 72°C for 1 min and 20 sec. The 5' PCR primer contained an EcoRI site with the sequence:

5'-CTGGAATTCACCTGGACCACCAATGGATA-3' (SEQ.ID.NO.: 75)

and the 3' primer contained a BamHI site with the sequence

5'-CTCGATCCTGCAAAGTTTGTATACAG TT-3' (SEQ.ID.NO.: 76).

- 10 The 1.2 kb PCR fragment was digested with EcoRI and BamHI and cloned into EcoRI-BamHI site of pCMV expression vector. Nucleic acid (SEQ.ID.NO.: 77) and amino acid (SEQ.ID.NO.: 78) sequences for human EBI2 were thereafter determined and verified.

27. ETBR-LP2 (GenBank Accession Number: D38449)

The cDNA for human ETBR-LP2 was generated and cloned into pCMV expression vector as follows: PCR was performed using brain cDNA as template and rTth polymerase (Perkin Elmer) with the buffer system provided by the manufacturer, 0.25 μ M of each primer, and 0.2 mM of each of the 4 nucleotides. The cycle condition was 30 cycles of: 94°C for 1 min; 65°C for 1min; and 72°C for 1.5 min. The 5' PCR contained an EcoRI site with the sequence:

- 20 5'-CTGGAATTCTCCTGCTCATCCAGCCATGCCG -3' (SEQ.ID.NO.: 79)

and the 3' primer contained a BamHI site with the sequence:

5'-CCTGGATCCCCACCCCTACTGGGCCTCAG -3' (SEQ.ID.NO.: 80).

The 1.5 kb PCR fragment was digested with EcoRI and BamHI and cloned into EcoRI-BamHI

- 42 -

site of pCMV expression vector. Nucleic acid (SEQ.ID.NO.: 81) and amino acid (SEQ.ID.NO.: 82) sequences for human ETBR-LP2 were thereafter determined and verified.

28. GHSR (GenBank Accession Number: U60179)

The cDNA for human GHSR was generated and cloned into pCMV expression
5 vector as follows: PCR was performed using hippocampus cDNA as template and TaqPlus Precision polymerase (Stratagene) with the buffer system provided by the manufacturer, 0.25 μ M of each primer, and 0.2 mM of each of the 4 nucleotides. The cycle condition was 30 cycles of: 94°C for 1 min; 68°C for 1min; and 72 °C for 1 min and 10 sec. For first round PCR, the 5' PCR primer sequence was:

10 5'-ATGTGGAACGCGACGCCAGCG-3' (SEQ.ID.NO.: 83)

and the 3' primer sequence was:

5'-TCATGTATTAATACTAGATTCT-3' (SEQ.ID.NO.: 84).

Two microliters of the first round PCR was used as template for the second round PCR where the 5' primer was kinased with sequence:

15 5'-TACCATGTGGAACGCGACGCCAGCGAAGAGCCGGGT-3'(SEQ.ID.NO.:85)

and the 3' primer contained an EcoRI site with the sequence:

5'-CGGAATTCATGTATTAATACTAGATTCTGTCCAGGCCCG-3'(SEQ.ID.NO.:86).

The 1.1 kb PCR fragment was digested with EcoRI and cloned into blunt-EcoRI site of pCMV expression vector. Nucleic acid (SEQ.ID.NO.: 87) and amino acid (SEQ.ID.NO.: 88) sequences
20 for human GHSR were thereafter determined and verified.

29. GPCR-CNS (GenBank Accession Number: AF017262)

The cDNA for human GPCR-CNS was generated and cloned into pCMV expression vector as follows: PCR was performed using brain cDNA as template and rTth

- 43 -

polymerase (Perkin Elmer) with the buffer system provided by the manufacturer, 0.25 μ M of each primer, and 0.2 mM of each of the 4 nucleotides. The cycle condition was 30 cycles of: 94°C for 1 min; 65°C for 1min; and 72 °C for 2 min. The 5' PCR primer contained a HindIII site with the sequence:

5'-GCAAGCTTGTGCCCTCACCAAGCCATGCGAGCC-3' (SEQ.ID.NO.: 89)

and the 3' primer contained an EcoRI site with the sequence:

5'-CGGAATTCAGCAATGAGTTCCGACAGAAGC-3' (SEQ.ID.NO.: 90).

The 1.9 kb PCR fragment was digested with HindIII and EcoRI and cloned into HindIII-EcoRI site of pCMV expression vector. All nine clones sequenced contained a potential polymorphism
10 involving a S284C change. Aside from this difference, nucleic acid (SEQ.ID.NO.: 91) and amino acid (SEQ.ID.NO.: 92) sequences for human GPCR-CNS were thereafter determined and verified.

30. GPR-NGA (GenBank Accession Number: U55312)

The cDNA for human GPR-NGA was generated and cloned into pCMV expression vector as follows: PCR was performed using genomic DNA as template and rTth

15 polymerase (Perkin Elmer) with the buffer system provided by the manufacturer, 0.25 μ M of each primer, and 0.2 mM of each of the 4 nucleotides. The cycle condition was 30 cycles of 94°C for 1 min, 56°C for 1min and 72 °C for 1.5 min. The 5' PCR primer contained an EcoRI site with the sequence:

5'-CAGAATTCAGAGAAAAAAGTGAATATGGTTTTT-3' (SEQ.ID.NO.: 93)

20 and the 3' primer contained a BamHI site with the sequence:

5'-TTGGATCCCTGGTGCATAACAATTGAAAGAAT-3' (SEQ.ID.NO.: 94).

The 1.3 kb PCR fragment was digested with EcoRI and BamHI and cloned into EcoRI-BamHI site of pCMV expression vector. Nucleic acid (SEQ.ID.NO.: 95) and amino acid (SEQ.ID.NO.:

- 44 -

96) sequences for human GPR-NGA were thereafter determined and verified.

31. H9 (GenBank Accession Number: U52219)

The cDNA for human HB954 was generated and cloned into pCMV expression vector as follows: PCR was performed using pituitary cDNA as template and rTth polymerase
5 (Perkin Elmer) with the buffer system provided by the manufacturer, 0.25 μ M of each primer, and 0.2 mM of each 4 nucleotides. The cycle condition was 30 cycles of: 94°C for 1 min, 62°C for 1min and 72°C for 2 min. The 5' PCR primer contains a HindIII site with the sequence:

5'-GGAAAGCTTAACGATCCCCAGGAGCAACAT-3' (SEQ.ID.NO.: 97)

and the 3' primer contains a BamHI site with the sequence:

10 5'-CTGGGATCCTACGAGAGCATTTTCACACAG-3' (SEQ.ID.NO.: 98).

The 1.9 kb PCR fragment was digested with HindIII and BamHI and cloned into HindIII-BamHI site of pCMV expression vector. When compared to the published sequences, a different isoform with 12 bp in frame insertion in the cytoplasmic tail was also identified and designated "H9b." Both isoforms contain two potential polymorphisms involving changes

15 of amino acid P320S and amino acid G448A. Isoform H9a contained another potential polymorphism of amino acid S493N, while isoform H9b contained two additional potential polymorphisms involving changes of amino acid I502T and amino acid A532T (corresponding to amino acid 528 of isoform H9a). Nucleic acid (SEQ.ID.NO.: 99) and amino acid (SEQ.ID.NO.: 100) sequences for human H9 were thereafter determined and
20 verified (in the section below, both isoforms were mutated in accordance with the Human GPCR Proline Marker Algorithm).

32. HB954 (GenBank Accession Number: D38449)

The cDNA for human HB954 was generated and cloned into pCMV expression

- 45 -

vector as follows: PCR was performed using brain cDNA as template and rTth polymerase (Perkin Elmer) with the buffer system provided by the manufacturer, 0.25 μ M of each primer, and 0.2 mM of each of the 4 nucleotides. The cycle condition was 30 cycles of 94°C for 1 min, 58°C for 1 min and 72°C for 2 min. The 5' PCR contained a HindIII site with the sequence:

5'-TCCAAGCTTCGCCATGGGACATAACGGGAGCT-3' (SEQ.ID.NO.: 101)

and the 3' primer contained an EcoRI site with the sequence:

5'-CGTGAATCCAAGAATTTACAATCCTTGCT-3' (SEQ.ID.NO.: 102).

The 1.6 kb PCR fragment was digested with HindIII and EcoRI and cloned into HindIII-EcoRI site of pCMV expression vector. Nucleic acid (SEQ.ID.NO.: 103) and amino acid (SEQ.ID.NO.: 104) sequences for human HB954 were thereafter determined and verified.

33. HG38 (GenBank Accession Number: AF062006)

The cDNA for human HG38 was generated and cloned into pCMV expression vector as follows: PCR was performed using brain cDNA as template and rTth polymerase (Perkin Elmer) with the buffer system provided by the manufacturer, 0.25 μ M of each primer, and 0.2 mM of each 4 nucleotides. The cycle condition was 30 cycles of 94°C for 1 min, 56°C for 1 min and 72°C for 1 min and 30 sec. Two PCR reactions were performed to separately obtain the 5' and 3' fragment. For the 5' fragment, the 5' PCR primer contained an HindIII site with the sequence:

5'-CCCAAGCTTCGGGCACCATGGACACCTCCC-3' (SEQ.ID.NO.: 259)

and the 3' primer contained a BamHIsite with the sequence:

5'-ACAGGATCCAAATGCACAGCACTGGTAAGC-3' (SEQ.ID.NO.: 260).

This 5' 1.5 kb PCR fragment was digested with HindIII and BamHI and cloned into an HindIII-BamHI site of pCMV. For the 3' fragment, the 5' PCR primer was kinased with the sequence:

5'-CTATAACTGGGTTACATGGTTAAC-3' (SEQ.ID.NO. 261)

- 46 -

and the 3' primer contained an EcoRI site with the sequence:

5'-TTTGAATTCACATATTAATTAGAGACATGG-3' (SEQ.ID.NO.: 262).

The 1.4 kb 3' PCR fragment was digested with EcoRI and subcloned into a blunt-EcoRI site of pCMV vector. The 5' and 3' fragments were then ligated together through a common EcoRV site to generate the full length cDNA clone. Nucleic acid (SEQ.ID.NO.: 263) and amino acid (SEQ.ID.NO.: 264) sequences for human HG38 were thereafter determined and verified.

34. HM74 (GenBank Accession Number: D10923)

The cDNA for human HM74 was generated and cloned into pCMV expression vector as follows: PCR was performed using either genomic DNA or thymus cDNA (pooled) as template and rTth polymerase (Perkin Elmer) with the buffer system provided by the manufacturer, 0.25 μ M of each primer, and 0.2 mM of each of the 4 nucleotides. The cycle condition was 30 cycles of: 94°C for 1 min; 65°C for 1min; and 72°C for 1 min and 20 sec. The 5' PCR primer contained an EcoRI site with the sequence:

5'-GGAGAATTCAGTCTAGGCGAGGCGCTCCATC-3' (SEQ.ID.NO.: 105)

and the 3' primer was kinased with the sequence:

5'-GGAGGATCCAGGAAACCTTAGGCCGAGTCC-3' (SEQ.ID.NO.:106).

The 1.3 kb PCR fragment was digested with EcoRI and cloned into EcoRI-SmaI site of pCMV expression vector. Clones sequenced revealed a potential polymorphism involving a N94K change. Aside from this difference, nucleic acid (SEQ.ID.NO.: 107) and amino acid (SEQ.ID.NO.: 108) sequences for human HM74 were thereafter determined and verified.

35. MIG (GenBank Accession Numbers: AF044600 and AF044601)

The cDNA for human MIG was generated and cloned into pCMV expression vector as follows: PCR was performed using genomic DNA as template and TaqPlus Precision

- 47 -

polymerase (Stratagene) for first round PCR or pfu polymerase (Stratagene) for second round PCR with the buffer system provided by the manufacturer, 0.25 μ M of each primer, and 0.2 mM (TaqPlus Precision) or 0.5 mM (pfu) of each of the 4 nucleotides. When pfu was used, 10% DMSO was included in the buffer. The cycle condition was 30 cycles of: 94°C for 1 min; 65°C for 1 min; and 72°C for: (a) 1 min for first round PCR; and (b) 2 min for second round PCR. Because there is an intron in the coding region, two sets of primers were separately used to generate overlapping 5' and 3' fragments. The 5' fragment PCR primers were:

5'-ACCATGGCTTGCAATGGCAGTGC GGCCAGGGGGCACT-3' (external sense)
(SEQ.ID.NO.: 109)

10 and

5'-CGACCAGGACAAACAGCATCTTGGTCACTTGCTCCGGC-3' (internal antisense)
(SEQ.ID.NO.: 110).

The 3' fragment PCR primers were:

5'-GACCAAGATGCTGTTTGTCTCCTGGTCGTGGTGTTCGCAT-3' (internal sense)

15 (SEQ.ID.NO.: 111) and

5'-CGGAATTCAGGATGGATCGGTCTCTTGCTGCGCCT-3' (external antisense with an EcoRI site) (SEQ.ID.NO.: 112).

The 5' and 3' fragments were ligated together by using the first round PCR as template and the kinased external sense primer and external antisense primer to perform second round PCR. The

20 1.2 kb PCR fragment was digested with EcoRI and cloned into the blunt-EcoRI site of pCMV expression vector. Nucleic acid (SEQ.ID.NO.: 113) and amino acid (SEQ.ID.NO.: 114) sequences for human MIG were thereafter determined and verified.

36. OGR1 (GenBank Accession Number: U48405)

- 48 -

The cDNA for human OGR1 was generated and cloned into pCMV expression vector as follows: PCR was performed using genomic DNA as template and rTth polymerase (Perkin Elmer) with the buffer system provided by the manufacturer, 0.25 μ M of each primer, and 0.2 mM of each of the 4 nucleotides. The cycle condition was 30 cycles of: 94°C for 1 min; 65°C for 1 min; and 72°C for 1 min and 20 sec. The 5' PCR primer was kinased with the sequence: 5'-GGAAGCTTCAGGCCCAAAGATGGGGAACAT-3' (SEQ.ID.NO.: 115); and the 3' primer contained a BamHI site with the sequence: 5'-GTGGATCCACCCGCGGAGGACCCAGGCTAG -3' (SEQ.ID.NO.: 116). The 1.1 kb PCR fragment was digested with BamHI and cloned into the EcoRV-BamHI site of pCMV expression vector. Nucleic acid (SEQ.ID.NO.: 117) and amino acid (SEQ.ID.NO.: 118) sequences for human OGR1 were thereafter determined and verified.

37. Serotonin 5HT_{2A}

The cDNA encoding endogenous human 5HT_{2A} receptor was obtained by RT-PCR using human brain poly-A⁺ RNA; a 5' primer from the 5' untranslated region with an Xho I restriction site:

5'-GACCTCGAGTCCTTCTACACCTCATC-3' (SEQ.ID.NO: 119)

and a 3' primer from the 3' untranslated region containing an Xba I site:

5'-TGCTCTAGATTCCAGATAGGTGAAAACCTTG-3' (SEQ.ID.NO: 120)

PCR was performed using either TaqPlus™ precision polymerase (Stratagene) or rTth™ polymerase (Perkin Elmer) with the buffer system provided by the manufacturers, 0.25 μ M of each primer, and 0.2 mM of each of the 4 nucleotides. The cycle condition was 30 cycles of: 94°C for 1 min; 57°C for 1 min; and 72°C for 2 min. The 1.5 kb PCR fragment was digested with Xba I and subcloned into Eco RV-Xba I site of pBluescript. The resulting cDNA clones were fully

- 49 -

sequenced and found to encode two amino acid changes from the published sequences. The first one was a T25N mutation in the N-terminal extracellular domain; the second is an H452Y mutation. Because cDNA clones derived from two independent PCR reactions using Taq polymerase from two different commercial sources (TaqPlus™ from Stratagene and rTth™ Perkin Elmer) contained the same two mutations, these mutations are likely to represent sequence polymorphisms rather than PCR errors. With these exceptions, the nucleic acid (SEQ.ID.NO.: 121) and amino acid (SEQ.ID.NO.: 122) sequences for human 5HT_{2A} were thereafter determined and verified.

38. Serotonin 5HT_{2C}

10 The cDNA encoding endogenous human 5HT_{2C} receptor was obtained from human brain poly-A⁺ RNA by RT-PCR. The 5' and 3' primers were derived from the 5' and 3' untranslated regions and contained the following sequences:

5'-GACCTCGAGGTGCTTAAGACTGAAGC-3' (SEQ.ID.NO.: 123)

5'-ATTTCTAGACATATGTAGCTGTACCG-3' (SEQ.ID.NO.: 124)

15 Nucleic acid (SEQ.ID.NO.: 125) and amino acid (SEQ.ID.NO.: 126) sequences for human 5HT_{2C} were thereafter determined and verified.

39. V28 (GenBank Accession Number: U20350)

The cDNA for human V28 was generated and cloned into pCMV expression vector as follows: PCR was performed using brain cDNA as template and rTth polymerase (Perkin Elmer) with the buffer system provided by the manufacturer, 0.25 μM of each primer, and 0.2 mM of each of the 4 nucleotides. The cycle condition was 30 cycles of: 94°C for 1 min; 65°C for 1 min; and 72°C for 1 min and 20 sec. The 5' PCR primer contained a HindIII site with the sequence:

20 5'-GGTAAGCTTGGCAGTCCACGCCAGGCCTTC-3' (SEQ.ID.NO.: 127)

- 50 -

and the 3' primer contained an EcoRI site with the sequence:

5'-TCCGAATTCTCTGTAGACACAAGGCTTTGG-3' (SEQ.ID.NO.: 128)

The 1.1 kb PCR fragment was digested with HindIII and EcoRI and cloned into HindIII-EcoRI site of pCMV expression vector. Nucleic acid (SEQ.ID.NO.: 129) and amino acid (SEQ.ID.NO.:

130) sequences for human V28 were thereafter determined and verified.

Example 2

PREPARATION OF NON-ENDOGENOUS HUMAN GPCRS

1. Site-Directed Mutagenesis

Mutagenesis based upon the Human GPCR Proline Marker approach disclosed herein was performed on the foregoing endogenous human GPCRs using Transformer Site-Directed Mutagenesis Kit (Clontech) according to the manufacturer instructions. For this mutagenesis approach, a Mutation Probe and a Selection Marker Probe (unless otherwise indicated, the probe of SEQ.ID.NO.: 132 was the same throughout) were utilized, and the sequences of these for the specified sequences are listed below in Table B (the parenthetical number is the SEQ. ID.NO.). For convenience, the codon mutation incorporated into the human GPCR is also noted, in standard form:

Table B

Receptor Identifier (Codon Mutation)	Mutation Probe Sequence (5'-3') (SEQ.ID.NO.)	Selection Marker Probe Sequence (5'-3') (SEQ.ID.NO.)
20 GPR1 (F245K)	GATCTCCAGTAGGCAT <u>AA</u> GT GGACAATTCTGG (131)	CTCCTTCGGTCTCTATCGT TGTCAGAAG (132)
GPR4 (K223A)	AGAAGGCCAAGATC <u>GCG</u> CGG CTGGCCCTCA (133)	CTCCTTCGGTCTCTATCGT TGTCAGAAGT
24 GPR5 (V224K)	CGGCGCCACCGCAG <u>AAAA</u> GCTCATCTTC	CTCCTTCGGTCTCTATCGT TGTCAGAAGT

- 51 -

		(134)	
	GPR7 (T250K)	GCACAAGACGGGTGAAGTT CCTGGTGGTGGCA (135)	CTCCTTCGGTCCTCTATCGT TGTCAGAAAGT
	GPR8 (T259K)	CAGGCGGAAGGTGAAGTCC TGGTCCTCGT (136)	CTCCTTCGGTCCTCTATCGT TGTCAGAAAGT
30	GPR9 (M254K)	CGGCGCTGCGGGCCAAAGCG GCTGGTGGTGGTG (137)	CTCCTTCGGTCCTCTATCGT TGTCAGAAAGT
	GPR9-6 (L241K)	CCAAGCACAAAGCCAAAGAAA GTGACCATCAC (138)	CTCCTTCGGTCCTCTATCGT TGTCAGAAAGT
35	GPR10 (F276K)	GCGCCGCGCACCAAAATGCT TGCTGGTGGT (139)	CTCCTTCGGTCCTCTATCGT TGTCAGAAAGT
	GPR15 (I240K)	CAAAAAGCTGAAGAAATCTA AGAAGATCATCTTATTGTG (140)	CTCCTTCGGTCCTCTATCGT TGTCAGAAAGT
	GPR17 (V234K)	CAAGACCAAGGCAAAACGCA TGATCGCCAT (141)	CTCCTTCGGTCCTCTATCGT TGTCAGAAAGT
40	GPR18 (I231K)	GTCAAGGAGAAGTCCAAAAG GATCATCATC (142)	CTCCTTCGGTCCTCTATCGT TGTCAGAAAGT
	GPR20 (M240K)	CGCCGCGTGGGGGCCAAGCA GCTCCTGCTC (143)	CTCCTTCGGTCCTCTATCGT TGTCAGAAAGT
45	GPR21 (A251K)	CCTGATAAGCGCTATAAAAT GGTCTGTTCGA (144)	CTCCTTCGGTCCTCTATCGT TGTCAGAAAGT
	GPR22 (F312K)	GAAAGACAAAAGAGAGTCA AGAGGATGCTTTATTG (145)	CTCCTTCGGTCCTCTATCGT TGTCAGAAAGT
	GPR24 (T304K)	CGGAGAAAGAGGGTGAAAC GCACAGCCATCGCC (146)	CTCCTTCGGTCCTCTATCGT TGTCAGAAAGT
50	GPR30 (L258K)	alternate approach; see below	alternate approach; see below
	GPR31 (Q221K)	AAGCTTCAGCGGCCAAGGC ACTGGTCACC (147)	CTCCTTCGGTCCTCTATCGT TGTCAGAAAGT
55	GPR32 (K255A)	CATGCCAACCGGCCGCGAG GCTGCTGCTGGT (279)	ACCAGCAGCAGCTCGCGGG CCGGTTGGCATG (280)
	GPR40 (A223K)	CGGAAGCTGCGGGCCAAATG GGTGCCCGGC (265)	CTCCTTCGGTCCTCTATCGT TGTCAGAAAGT
	GPR41	CAGAGGAGGGTGAAGGGGCT GTTGGCG	CTCCTTCGGTCCTCTATCGT TGTCAGAAAGT

- 52 -

	(A223K)	(266)	
	GPR43 (V221K)	GGCGGCCCGAGCC <u>AA</u> GGGG CTGGCTGTGG	CTCCTTCGGTCTCTATCGT TGTCAGAAAT
	APJ (L247K)	alternate approach; <i>see below</i>	alternate approach; <i>see below</i>
5	BLR1 (V258K)	CAGCGGCAGAAAGCC <u>AAAA</u> GGGTGGCCATC (148)	CTCCTTCGGTCTCTATCGT TGTCAGAAAT
	CEPR (L258K)	CGGCAGAAAGCGC <u>AA</u> GCGCAT GATCCTCGCG (149)	CTCCTTCGGTCTCTATCGT TGTCAGAAAT
10	EBI1 (I262K)	GAGCGCAACAAGGCC <u>AAAA</u> AGGTGATCATC (150)	CTCCTTCGGTCTCTATCGT TGTCAGAAAT
	EBI2 (L243K)	GGTGTAAACAAAAAGGCT <u>AA</u> <u>AA</u> ACACAATTAATCTTATT (151)	CTCCTTCGGTCTCTATCGT TGTCAGAAAT
	ETBR-LP2 (N358K)	GAGAGCCAGCTC <u>AA</u> GAGCAC CGTGGTG (152)	CTCCTTCGGTCTCTATCGT TGTCAGAAAT
15	GHSR (V262K)	CCACAAGCAAACC <u>AA</u> GAAAA TGCTGGCTGT (153)	CTCCTTCGGTCTCTATCGT TGTCAGAAAT
	GPCR-CNS (N491K)	CTAGAGAGTCAGATG <u>AA</u> GTG TACAGTAGTGCCAC (155)	CTCCTTCGGTCTCTATCGT TGTCAGAAAT
20	GPR-NGA (I275K)	OGGACAAAAGTGAAAACT <u>AA</u> <u>AA</u> AGATGTTCTCTATT (156)	CTCCTTCGGTCTCTATCGT TGTCAGAAAT
	H9a and H9b (F236K)	GCTGAGGTTGCAAT <u>AA</u> ACT AACCATGTTTGTG (157)	CTCCTTCGGTCTCTATCGT TGTCAGAAAT
	HB954 (H265K)	GGGAGGCCGAGCTG <u>AA</u> AGGCC ACCCTGCTC (158)	CTCCTTCGGTCTCTATCGT TGTCAGAAAT
25	HG38 (V765K)	GGGACTGCTCTATG <u>AAAAA</u> CACATTGCCCTG (268)	CATCAAGTGATCATGTGCC AAGTACGCC (154)
	HM74 (I230K)	CAAGATCAAGAGAGCC <u>AAAA</u> CCTTCATCATG (159)	CTCCTTCGGTCTCTATCGT TGTCAGAAAT
30	MIG (T273K)	CGGAGACAAAGTG <u>AA</u> GAAG ATGCTGTTTGTG (160)	CTCCTTCGGTCTCTATCGT TGTCAGAAAT
	OGR1 (Q227K)	GCAAGGACCATGATC <u>AA</u> GCGG CTGGTGCTCA (161)	CTCCTTCGGTCTCTATCGT TGTCAGAAAT
	Serotonin 5HT _{2A} (C322K)	alternate approach; <i>see below</i>	alternate approach; <i>see below</i>
35	Serotonin 5HT _{2C} (S310K)	alternate approach; <i>see below</i>	alternate approach; <i>see below</i>

- 53 -

V28 (I230K)	CAAGAAAGCCAAAGCCAAAG AAACTGATCCTTCTG (162)	CTCCTTCGGTCTCCTATCGT TGTCAGAAAGT
----------------	--	-------------------------------------

The non-endogenous human GPCRs were then sequenced and the derived and verified nucleic acid and amino acid sequences are listed in the accompanying "Sequence Listing" appendix

5 to this patent document, as summarized in Table C below:

Table C

Mutated GPCR	Nucleic Acid Sequence Listing	Amino Acid Sequence Listing
GPR1 (F245K)	SEQ.ID.NO.: 163	SEQ.ID.NO.: 164
10 GPR4 (K223A)	SEQ.ID.NO.: 165	SEQ.ID.NO.: 166
GPR5 (V224K)	SEQ.ID.NO.: 167	SEQ.ID.NO.: 168
15 GPR7 (T250K)	SEQ.ID.NO.: 169	SEQ.ID.NO.: 170
GPR8 (T259K)	SEQ.ID.NO.: 171	SEQ.ID.NO.: 172
GPR9 (M254K)	SEQ.ID.NO.: 173	SEQ.ID.NO.: 174
20 GPR9-6 (L241K)	SEQ.ID.NO.: 175	SEQ.ID.NO.: 176
GPR10 (F276K)	SEQ.ID.NO.: 177	SEQ.ID.NO.: 178
25 GPR15 (I240K)	SEQ.ID.NO.: 179	SEQ.ID.NO.: 180
GPR17 (V234K)	SEQ.ID.NO.: 181	SEQ.ID.NO.: 182
GPR18 (I231K)	SEQ.ID.NO.: 183	SEQ.ID.NO.: 184
30 GPR20 (M240K)	SEQ.ID.NO.: 185	SEQ.ID.NO.: 186
GPR21 (A251K)	SEQ.ID.NO.: 187	SEQ.ID.NO.: 188
35 GPR22 (F312K)	SEQ.ID.NO.: 189	SEQ.ID.NO.: 190
GPR24 (T304K)	SEQ.ID.NO.: 191	SEQ.ID.NO.: 192
GPR30	SEQ.ID.NO.: 193	SEQ.ID.NO.: 194

- 54 -

	(L258K)		
	GPR31 (Q221K)	SEQ.ID.NO.: 195	SEQ.ID.NO.: 196
5	GPR32 (K255A)	SEQ.ID.NO.: 269	SEQ.ID.NO.: 270
	GPR40 (A223K)	SEQ.ID.NO.: 271	SEQ.ID.NO.: 272
	GPR41 (A223K)	SEQ.ID.NO.: 273	SEQ.ID.NO.: 274
10	GPR43 (V221K)	SEQ.ID.NO.: 275	SEQ.ID.NO.: 276
	APJ (L247K)	SEQ.ID.NO.: 197	SEQ.ID.NO.: 198
15	BLR1 (V258K)	SEQ.ID.NO.: 199	SEQ.ID.NO.: 200
	CEPR (L258K)	SEQ.ID.NO.: 201	SEQ.ID.NO.: 202
	EBI1 (I262K)	SEQ.ID.NO.: 203	SEQ.ID.NO.: 204
20	EBI2 (L243K)	SEQ.ID.NO.: 205	SEQ.ID.NO.: 206
	ETBR-LP2 (N358K)	SEQ.ID.NO.: 207	SEQ.ID.NO.: 208
25	GHSR (V262K)	SEQ.ID.NO.: 209	SEQ.ID.NO.: 210
	GPCR-CNS (N491K)	SEQ.ID.NO.: 211	SEQ.ID.NO.: 212
	GPR-NGA (I275K)	SEQ.ID.NO.: 213	SEQ.ID.NO.: 214
30	H9a (F236K)	SEQ.ID.NO.: 215	SEQ.ID.NO.: 216
	H9b (F236K)	SEQ.ID.NO.: 217	SEQ.ID.NO.: 218
35	HB954 (H265K)	SEQ.ID.NO.: 219	SEQ.ID.NO.: 220
	HG38 (V765K)	SEQ.ID.NO.: 277	SEQ.ID.NO.: 278
	HM74 (I230K)	SEQ.ID.NO.: 221	SEQ.ID.NO.: 222
40	MIG (T273K)	SEQ.ID.NO.: 223	SEQ.ID.NO.: 224
	OGR1 (Q227K)	SEQ.ID.NO.: 225	SEQ.ID.NO.: 226
45	Serotonin 5HT _{2A} (C322K)	SEQ.ID.NO.: 227	SEQ.ID.NO.: 228
	Serotonin 5HT _{2C} (S310K)	SEQ.ID.NO.: 229	SEQ.ID.NO.: 230
	V28 (I230K)	SEQ.ID.NO.: 231	SEQ.ID.NO.: 232

- 55 -

2. **Alternate Mutation Approaches for Employment of the Proline Marker Algorithm: APJ; Serotonin 5HT_{2A}; Serotonin 5HT_{2C}; and GPR30**

Although the above site-directed mutagenesis approach is particularly preferred, other approaches can be utilized to create such mutations; those skilled in the art are readily credited

- 5 with selecting approaches to mutating a GPCR that fits within the particular needs of the artisan.

a. APJ

Preparation of the non-endogenous, human APJ receptor was accomplished by mutating L247K. Two oligonucleotides containing this mutation were synthesized:

5'-GGCTTAAGAGCATCATCGTGGTGCTGGT-3' (SEQ.ID.NO.: 233)

- 10 5'-GTCACCACCAGCACCAGATGATGCTCTTAAGCC-3' (SEQ.ID.NO.: 234)

The two oligonucleotides were annealed and used to replace the NciI-BstEII fragment of human, endogenous APJ to generate the non-endogenous, version of human APJ.

b. Serotonin 5HT_{2A}

cDNA containing the point mutation C322K was constructed by utilizing the restriction enzyme site Sph I which encompasses amino acid 322. A primer containing the C322K mutation:

5'-CAAAGAAAGTACTGGGCATCGTCTTCTTCCT-3' (SEQ.ID.NO: 235)

was used along with the primer from the 3' untranslated region of the receptor:

5'-TGCTCTAGATTCCAGATAGGTGAAAA CTTG-3' (SEQ.ID.NO.: 236)

to perform PCR (under the conditions described above). The resulting PCR fragment was then

- 20 used to replace the 3' end of endogenous 5HT_{2A} cDNA through the T4 polymerase blunted Sph I site.

c. Serotonin 5HT_{2C}

The cDNA containing a S310K mutation was constructed by replacing the Sty I restriction fragment containing amino acid 310 with synthetic double stranded oligonucleotides that encode

- 56 -

the desired mutation. The sense strand sequence utilized had the following sequence:

5'-CTAGGGGCACCATGCAGGCTATCAACAATGAAAGAAAAGCTAAGAAAGTC-3'
(SEQ. ID.NO.: 237)

and the antisense strand sequence utilized had the following sequence:

5 5'-CAAGGACTTTCTAGCTTTTCTTTCATTGTGTGATAGCCTGCATGGTGCCC-3' (SEQ.
ID. NO.: 238)

d. GPR30

Prior to generating non-endogenous GPR30, several independent pCR2.1/GPR30 isolates were sequenced in their entirety in order to identify clones with no PCR-generated mutations. A
10 clone having no mutations was digested with EcoRI and the endogenous GPR30 cDNA fragment was transferred into the CMV-driven expression plasmid pCI-neo (Promega), by digesting pCI-Neo with EcoRI and subcloning the EcoRI-liberated GPR30 fragment from pCR2.1/GPR30, to generate pCI/GPR30. Thereafter, the leucine at codon 258 was mutated to a lysine using a Quick-Change™ Site-Directed Mutagenesis Kit (Stratagene, #200518), according to manufacturer's
15 instructions, and the following primers:

5'-CGGCGGCAGAAAGGCGAAACGCATGATCCTCGCGGT-3' (SEQ.ID.NO.: 239) and
5'-ACCGCGAGGATCATGCGTTTCGCTTCTGC CGCCG-3' (SEQ.ID.NO.: 240)

Example 3

Receptor (Endogenous and Mutated) Expression

20

Although a variety of cells are available to the art for the expression of proteins, it is most preferred that mammalian cells be utilized. The primary reason for this is predicated upon practicalities, *i.e.*, utilization of, *e.g.*, yeast cells for the expression of a GPCR, while possible,

- 57 -

introduces into the protocol a non-mammalian cell which may not (indeed, in the case of yeast, does not) include the receptor-coupling, genetic-mechanism and secretory pathways that have evolved for mammalian systems – thus, results obtained in non-mammalian cells, while of potential use, are not as preferred as that obtained from mammalian cells. Of the mammalian cells, COS-7, 293 and 293T cells are particularly preferred, although the specific mammalian cell utilized can be predicated upon the particular needs of the artisan.

Unless otherwise noted herein, the following protocol was utilized for the expression of the endogenous and non-endogenous human GPCRs. Table D lists the mammalian cell and number utilized (per 150mm plate) for GPCR expression.

Table D

Receptor Name (Endogenous or Non-Endogenous)	Mammalian Cell (Number Utilized)
GPR17	293 (2×10^6)
GPR30	293 (4×10^6)
APJ	COS-7 (5×10^6)
ETBR-LP2	293 (1×10^7)
	293T (1×10^7)
GHSR	293 (1×10^7)
	293T (1×10^7)
MIG	293 (1×10^7)
Serotonin 5HT _{2A}	293T (1×10^7)
Serotonin 5HT _{2c}	293T (1×10^7)

On day one, mammalian cells were plated out. On day two, two reaction tubes were prepared (the proportions to follow for each tube are per plate): tube A was prepared by mixing 20μg DNA (e.g., pCMV vector, pCMV vector with endogenous receptor cDNA, and pCMV vector with non-endogenous receptor cDNA.) in 1.2ml serum free DMEM (Irvine Scientific,

- 58 -

Irvine, CA); tube B was prepared by mixing 120 μ l lipofectamine (Gibco BRL) in 1.2ml serum free DMEM. Tubes A and B were then admixed by inversions (several times), followed by incubation at room temperature for 30-45min. The admixture is referred to as the "transfection mixture". Plated cells were washed with 1XPBS, followed by addition of 10ml serum free DMEM. 2.4ml of the transfection mixture was then added to the cells, followed by incubation for 4hrs at 37°C/5% CO₂. The transfection mixture was then removed by aspiration, followed by the addition of 25ml of DMEM/10% Fetal Bovine Serum. Cells were then incubated at 37°C/5% CO₂. After 72hr incubation, cells were then harvested and utilized for analysis.

1. Gi-Coupled Receptors: Co-Transfection with Gs-Coupled Receptors

10 In the case of GPR30, it has been determined that this receptor couples the G protein Gi. Gi is known to inhibit the enzyme adenylyl cyclase, which is necessary for catalyzing the conversion of ATP to cAMP. Thus, a non-endogenous, constitutively activated form of GPR30 would be expected to be associated with decreased levels of cAMP. Assay confirmation of a non-endogenous, constitutively activated form of GPR30 directly via measurement of decreasing levels
15 of cAMP, while viable, can be preferably measured by cooperative use of a Gs-coupled receptor. For example, a receptor that is Gs-coupled will stimulate adenylyl cyclase, and thus will be associated with an increase in cAMP. The assignee of the present application has discovered that the orphan receptor GPR6 is an endogenous, constitutively activated GPCR. GPR6 couples to the Gs protein. Thus when co-transfected, one can readily verify that a putative GPR30-mutation
20 leads to constitutive activation thereof: *i.e.*, an endogenous, constitutively activated GPR6/endogenous, non-constitutively activated GPR30 cell will evidence an elevated level of cAMP when compared with an endogenous, constitutively active GPR6/non-endogenous, constitutively activated GPR30 (the latter evidencing a comparatively lower level of cAMP).

- 59 -

Assays that detect cAMP can be utilized to determine if a candidate compound is *e.g.*, an inverse agonist to a Gs-associated receptor (*i.e.*, such a compound would decrease the levels of cAMP) or a Gi-associated receptor (or a Go-associated receptor) (*i.e.*, such a candidate compound would increase the levels of cAMP). A variety of approaches known in the art for measuring cAMP can be utilized; a preferred approach relies upon the use of anti-cAMP antibodies. Another approach, and most preferred, utilizes a whole cell second messenger reporter system assay. Promoters on genes drive the expression of the proteins that a particular gene encodes. Cyclic AMP drives gene expression by promoting the binding of a cAMP-responsive DNA binding protein or transcription factor (CREB) which then binds to the promoter at specific sites called cAMP response elements and drives the expression of the gene. Reporter systems can be constructed which have a promoter containing multiple cAMP response elements before the reporter gene, *e.g.*, β -galactosidase or luciferase. Thus, an activated receptor such as GPR6 causes the accumulation of cAMP which then activates the gene and expression of the reporter protein. Most preferably, 293 cells are co-transfected with GPR6 (or another Gs-linked receptor) and GPR30 (or another Gi-linked receptor) plasmids, preferably in a 1:1 ratio, most preferably in a 1:4 ratio. Because GPR6 is an endogenous, constitutively active receptor that stimulates the production of cAMP, GPR6 strongly activates the reporter gene and its expression. The reporter protein such as β -galactosidase or luciferase can then be detected using standard biochemical assays (Chen et al. 1995). Co-transfection of endogenous, constitutively active GPR6 with endogenous, non-constitutively active GPR30 evidences an increase in the luciferase reporter protein. Conversely, co-transfection of endogenous, constitutively active GPR6 with non-endogenous, constitutively active GPR30 evidences a drastic decrease in expression of luciferase. Several reporter plasmids are known and available in the art for measuring a second messenger assay. It is considered well within the

- 60 -

skilled artisan to determine an appropriate reporter plasmid for a particular gene expression based primarily upon the particular need of the artisan. Although a variety of cells are available for expression, mammalian cells are most preferred, and of these types, 293 cells are most preferred. 293 cells were transfected with the reporter plasmid pCRE-Luc/GPR6 and non-endogenous, 5 constitutively activated GPR30 using a Mammalian Transfection™ Kit (Stratagene, #200285) CaPO₄ precipitation protocol according to the manufacturer's instructions (*see*, 28 Genomics 347 (1995) for the published endogenous GPR6 sequence). The precipitate contained 400ng reporter, 80ng CMV-expression plasmid (having a 1:4 GPR6 to endogenous GPR30 or non-endogenous GPR30 ratio) and 20ng CMV-SEAP (a transfection control plasmid encoding secreted alkaline 10 phosphatase). 50% of the precipitate was split into 3 wells of a 96-well tissue culture dish (containing 4X10⁴ cells/well); the remaining 50% was discarded. The following morning, the media was changed. 48 hr after the start of the transfection, cells were lysed and examined for luciferase activity using a Lucite™ Kit (Packard, Cat. # 6016911) and Trilux 1450 Microbeta™ liquid scintillation and luminescence counter (Wallac) as per the vendor's instructions. The data 15 were analyzed using GraphPad Prism 2.0a (GraphPad Software Inc.).

With respect to GPR17, which has also been determined to be Gi-linked, a modification of the foregoing approach was utilized, based upon, *inter alia*, use of another Gs-linked endogenous receptor, GPR3 (*see* 23 Genomics 609 (1994) and 24 Genomics 391 (1994)). Most preferably, 293 cells are utilized. These cells were plated-out on 96 well plates at a density of 2 20 x 10⁴ cells per well and were transfected using Lipofectamine Reagent (BRL) the following day according to manufacturer instructions. A DNA/lipid mixture was prepared for each 6-well transfection as follows: 260ng of plasmid DNA in 100μl of DMEM were gently mixed with 2μl of lipid in 100μl of DMEM (the 260ng of plasmid DNA consisted of 200ng of a 8xCRE-Luc

- 61 -

reporter plasmid (see below), 50ng of pCMV comprising endogenous receptor or non-endogenous receptor or pCMV alone, and 10ng of a GPRS expression plasmid (GPRS in pcDNA3 (Invitrogen)). The 8xCRE-Luc reporter plasmid was prepared as follows: vector SRIF- β -gal was obtained by cloning the rat somatostatin promoter (-71/+51) at BglV-HindIII site in the p β -gal-
5 Basic Vector (Clontech). Eight (8) copies of cAMP response element were obtained by PCR from an adenovirus template AdpCF126CCRE8 (see 7 Human Gene Therapy 1883 (1996)) and cloned into the SRIF- β -gal vector at the Kpn-BglV site, resulting in the 8xCRE- β -gal reporter vector. The 8xCRE-Luc reporter plasmid was generated by replacing the beta-galactosidase gene in the 8xCRE- β -gal reporter vector with the luciferase gene obtained from the pGL3-basic vector
10 (Promega) at the HindIII-BamHI site. Following 30min. incubation at room temperature, the DNA/lipid mixture was diluted with 400 μ l of DMEM and 100 μ l of the diluted mixture was added to each well. 100 μ l of DMEM with 10% FCS were added to each well after a 4hr incubation in a cell culture incubator. The next morning the transfected cells were changed with 200 μ l/well of DMEM with 10% FCS. Eight (8) hours later, the wells were changed to 100 μ l/well of DMEM
15 without phenol red, after one wash with PBS. Luciferase activity were measured the next day using the LucLite™ reporter gene assay kit (Packard) following manufacturer instructions and read on a 1450 MicroBeta™ scintillation and luminescence counter (Wallac).

Figure 4 evidences that constitutively active GPR30 inhibits GPR6-mediated activation of CRE-Luc reporter in 293 cells. Luciferase was measured at about 4.1 relative
20 light units in the expression vector pCMV. Endogenous GPR30 expressed luciferase at about 8.5 relative light units, whereas the non-endogenous, constitutively active GPR30 (L258K), expressed luciferase at about 3.8 and 3.1 relative light units, respectively. Co-transfection of endogenous GPR6 with endogenous GPR30, at a 1:4 ratio, drastically increased luciferase

- 62 -

expression to about 104.1 relative light units. Co-transfection of endogenous GPR6 with non-endogenous GPR30 (L258K), at the same ratio, drastically decreased the expression, which is evident at about 18.2 and 29.5 relative light units, respectively. Similar results were observed with respect to GPR17 with respect to co-transfection with GPR3, as set forth in

5 Figure 5.

Example 3

ASSAYS FOR DETERMINATION OF CONSTITUTIVE ACTIVITY OF NON-ENDOGENOUS GPCRS

A. Membrane Binding Assays

10 1. [³⁵S]GTPγS Assay

When a G protein-coupled receptor is in its active state, either as a result of ligand binding or constitutive activation, the receptor couples to a G protein and stimulates the release of GDP and subsequent binding of GTP to the G protein. The alpha subunit of the G protein-receptor complex acts as a GTPase and slowly hydrolyzes the GTP to GDP, at which point the receptor normally is deactivated. Constitutively activated receptors continue to exchange GDP for GTP. The non-hydrolyzable GTP analog, [³⁵S]GTPγS, can be utilized to demonstrate enhanced binding of [³⁵S]GTPγS to membranes expressing constitutively activated receptors. The advantage of using [³⁵S]GTPγS binding to measure constitutive activation is that: (a) it is generically applicable to all G protein-coupled receptors; (b) it is proximal at the membrane surface making it less likely to pick-up molecules which affect the intracellular cascade.

The assay utilizes the ability of G protein coupled receptors to stimulate [³⁵S]GTPγS binding to membranes expressing the relevant receptors. The assay can, therefore, be used in the direct identification method to screen candidate compounds to known, orphan and constitutively activated G protein-coupled receptors. The assay is generic and has application

- 63 -

to drug discovery at all G protein-coupled receptors.

The [³⁵S]GTPγS assay was incubated in 20 mM HEPES and between 1 and about 20mM MgCl₂ (this amount can be adjusted for optimization of results, although 20mM is preferred) pH 7.4, binding buffer with between about 0.3 and about 1.2 nM [³⁵S]GTPγS (this amount can be adjusted
5 for optimization of results, although 1.2 is preferred) and 12.5 to 75 μg membrane protein (*e.g.* COS-7 cells expressing the receptor; this amount can be adjusted for optimization, although 75μg is preferred) and 1 μM GDP (this amount can be changed for optimization) for 1 hour. Wheatgerm agglutinin beads (25 μl; Amersham) were then added and the mixture was incubated for another 30 minutes at room temperature. The tubes were then centrifuged at 1500 x g for 5
10 minutes at room temperature and then counted in a scintillation counter.

A less costly but equally applicable alternative has been identified which also meets the needs of large scale screening. Flash plates™ and Wallac™ scintistrips may be utilized to format a high throughput [³⁵S]GTPγS binding assay. Furthermore, using this technique, the assay can be utilized for known GPCRs to simultaneously monitor tritiated ligand binding to the receptor at the
15 same time as monitoring the efficacy via [³⁵S]GTPγS binding. This is possible because the Wallac beta counter can switch energy windows to look at both tritium and ³⁵S-labeled probes. This assay may also be used to detect other types of membrane activation events resulting in receptor activation. For example, the assay may be used to monitor ³²P phosphorylation of a variety of receptors (both G protein coupled and tyrosine kinase receptors). When the membranes are
20 centrifuged to the bottom of the well, the bound [³⁵S]GTPγS or the ³²P-phosphorylated receptor will activate the scintillant which is coated of the wells. Scinti® strips (Wallac) have been used to demonstrate this principle. In addition, the assay also has utility for measuring ligand binding to receptors using radioactively labeled ligands. In a similar manner, when the radiolabeled bound

- 64 -

ligand is centrifuged to the bottom of the well, the scintistrip label comes into proximity with the radiolabeled ligand resulting in activation and detection.

Representative results of graph comparing Control (pCMV), Endogenous APJ and Non-Endogenous APJ, based upon the foregoing protocol, are set forth in Figure 6.

5 2. **Adenylyl Cyclase**

A Flash Plate™ Adenylyl Cyclase kit (New England Nuclear; Cat. No. SMP004A) designed for cell-based assays was modified for use with crude plasma membranes. The Flash Plate wells contain a scintillant coating which also contains a specific antibody recognizing cAMP. The cAMP generated in the wells was quantitated by a direct competition for binding of
10 radioactive cAMP tracer to the cAMP antibody. The following serves as a brief protocol for the measurement of changes in cAMP levels in membranes that express the receptors.

Transfected cells were harvested approximately three days after transfection. Membranes were prepared by homogenization of suspended cells in buffer containing 20mM HEPES, pH 7.4 and 10mM MgCl₂. Homogenization was performed on ice using a Brinkman Polytron™ for
15 approximately 10 seconds. The resulting homogenate was centrifuged at 49,000 X g for 15 minutes at 4°C. The resulting pellet was then resuspended in buffer containing 20mM HEPES, pH 7.4 and 0.1 mM EDTA, homogenized for 10 seconds, followed by centrifugation at 49,000 X g for 15 minutes at 4°C. The resulting pellet can be stored at -80°C until utilized. On the day of measurement, the membrane pellet was slowly thawed at room temperature, resuspended in buffer
20 containing 20mM HEPES, pH 7.4 and 10mM MgCl₂ (these amounts can be optimized, although the values listed herein are preferred), to yield a final protein concentration of 0.60mg/ml (the resuspended membranes were placed on ice until use).

cAMP standards and Detection Buffer (comprising 2 µCi of tracer [¹²⁵I] cAMP (100 µl) to

- 65 -

11 ml Detection Buffer) were prepared and maintained in accordance with the manufacturer's instructions. Assay Buffer was prepared fresh for screening and contained 20mM HEPES, pH 7.4, 10mM $MgCl_2$, 20mM (Sigma), 0.1 units/ml creatine phosphokinase (Sigma), 50 μ M GTP (Sigma), and 0.2 mM ATP (Sigma); Assay Buffer can be stored on ice until utilized. The assay
5 was initiated by addition of 50ul of assay buffer followed by addition of 50ul of membrane suspension to the NEN Flash Plate. The resultant assay mixture is incubated for 60 minutes at room temperature followed by addition of 100ul of detection buffer. Plates are then incubated an additional 2-4 hours followed by counting in a Wallac MicroBeta scintillation counter. Values of cAMP/well are extrapolated from a standard cAMP curve which is contained within each assay
10 plate. The foregoing assay was utilized with respect to analysis of MIG.

B. Reporter-Based Assays

1. CREB Reporter Assay (Gs-associated receptors)

A method to detect Gs stimulation depends on the known property of the transcription factor CREB, which is activated in a cAMP-dependent manner. A PathDetect CREB trans-
15 Reporting System (Stratagene, Catalogue # 219010) was utilized to assay for Gs coupled activity in 293 or 293T cells. Cells were transfected with the plasmids components of this above system and the indicated expression plasmid encoding endogenous or mutant receptor using a Mammalian Transfection Kit (Stratagene, Catalogue #200285) according to the manufacturer's instructions. Briefly, 400 ng pFR-Luc (luciferase reporter plasmid containing
20 Gal4 recognition sequences), 40 ng pFA2-CREB (Gal4-CREB fusion protein containing the Gal4 DNA-binding domain), 80 ng CMV-receptor expression plasmid (comprising the receptor) and 20 ng CMV-SEAP (secreted alkaline phosphatase expression plasmid; alkaline phosphatase activity is measured in the media of transfected cells to control for variations in

- 66 -

transfection efficiency between samples) were combined in a calcium phosphate precipitate as per the Kit's instructions. Half of the precipitate was equally distributed over 3 wells in a 96-well plate, kept on the cells overnight, and replaced with fresh medium the following morning. Forty-eight (48) hr after the start of the transfection, cells were treated and assayed for luciferase activity as set forth with respect to the GPR30 system, above. This assay was used with respect to GHSR.

2. AP1 reporter assay (Gq-associated receptors)

A method to detect Gq stimulation depends on the known property of Gq-dependent phospholipase C to cause the activation of genes containing AP1 elements in their promoter.

10 A Pathdetect AP-1 cis-Reporting System (Stratagene, Catalogue # 219073) was utilized following the protocol set forth above with respect to the CREB reporter assay, except that the components of the calcium phosphate precipitate were 410 ng pAP1-Luc, 80 ng receptor expression plasmid, and 20 ng CMV-SEAP. This assay was used with respect to ETBR-LP2

C. Intracellular IP3 Accumulation Assay

15 On day 1, cells comprising the serotonin receptors (endogenous and mutated) were plated onto 24 well plates, usually 1×10^5 cells/well. On day 2 cells were transfected by firstly mixing 0.25ug DNA in 50 ul serumfree DMEM/well and 2 ul lipofectamine in 50 ul serumfree DMEM/well. The solutions were gently mixed and incubated for 15-30 min at room temperature. Cells were washed with 0.5 ml PBS and 400 ul of serum free media was
20 mixed with the transfection media and added to the cells. The cells were then incubated for 3-4 hrs at 37°C/5%CO₂ and then the transfection media was removed and replaced with 1ml/well of regular growth media. On day 3 the cells were labeled with ³H-myo-inositol. Briefly, the media was removed the cells were washed with 0.5 ml PBS. Then 0.5 ml inositol-free/serumfree media (GIBCO BRL) was added/well with 0.25 μCi of ³H-myo-inositol / well

- 67 -

and the cells were incubated for 16-18 hrs o/n at 37°C/5%CO₂. On Day 4 the cells were washed with 0.5 ml PBS and 0.45 ml of assay medium was added containing inositol-free/serum free media 10 µM pargyline 10 mM lithium chloride or 0.4 ml of assay medium and 50 µl of 10x ketanserin (ket) to final concentration of 10µM. The cells were then

5 incubated for 30 min at 37°C. The cells were then washed with 0.5 ml PBS and 200 µl of fresh/icecold stop solution (1M KOH; 18 mM Na-borate; 3.8 mM EDTA) was added/well. The solution was kept on ice for 5-10 min or until cells were lysed and then neutralized by 200 µl of fresh/ice cold neutralization sol. (7.5 % HCL). The lysate was then transferred into 1.5 ml eppendorf tubes and 1 ml of chloroform/methanol (1:2) was added/tube. The solution

10 was vortexed for 15 sec and the upper phase was applied to a Biorad AG1-X8 anion exchange resin (100-200 mesh). Firstly, the resin was washed with water at 1:1.25 W/V and 0.9 ml of upper phase was loaded onto the column. The column was washed with 10 mls of 5 mM myo-inositol and 10 ml of 5 mM Na-borate/60mM Na-formate. The inositol tris phosphates were eluted into scintillation vials containing 10 ml of scintillation cocktail with

15 2 ml of 0.1 M formic acid/ 1 M ammonium formate. The columns were regenerated by washing with 10 ml of 0.1 M formic acid/3M ammonium formate and rinsed twice with dd H₂O and stored at 4°C in water.

Figure 7 provides an illustration of IP3 production from the human 5-HT_{2A} receptor that incorporates the C322K mutation. While these results evidence that the Proline Mutation

20 Algorithm approach constitutively activates this receptor, for purposes of using such a receptor for screening for identification of potential therapeutics, a more robust difference would be preferred. However, because the activated receptor can be utilized for understanding and elucidating the role of constitutive activation and for the identification of compounds that

- 68 -

can be further examined, we believe that this difference is itself useful in differentiating between the endogenous and non-endogenous versions of the human 5HT_{2A} receptor.

D. Result Summary

The results for the GPCRs tested are set forth in Table E where the Per-Cent Increase indicates the percentage difference in results observed for the non-endogenous GPCR as compared to the endogenous GPCR; these values are followed by parenthetical indications as to the type of assay utilized. Additionally, the assay system utilized is parenthetically listed (and, in cases where different Host Cells were used, both are listed). As these results indicate, a variety of assays can be utilized to determine constitutive activity of the non-endogenous versions of the human GPCRs.

Those skilled in the art, based upon the foregoing and with reference to information available to the art, are credited with the ability to select and/or maximize a particular assay approach that suits the particular needs of the investigator.

Table E

Receptor Identifier (Codon Mutation)	Per-Cent Difference
GPR17	74.5
(V234K)	(CRE-Luc)
GPR30	71.6
(L258K)	(CREB)
APJ	49.0
(L247K)	(GTP _γ S)
ETBR-LP2	48.4(AP1-Luc - 293)
(N358K)	61.1(AP1-Luc - 293T)
GHSR	58.9(CREB - 293)
(V262K)	35.6(CREB - 293T)

- 69 -

MIG (I230K)	39 (cAMP)
Serotonin 5HT _{2A} (C322K)	33.2 (IP ₃)
Serotonin 5HT _{2C} (S310K)	39.1 (IP ₃)

Example 6**Tissue Distribution of Endogenous Orphan GPCRs**

Using a commercially available human-tissue dot-blot format, endogenous orphan GPCRs were probed for a determination of the areas where such receptors are localized. Except as indicate below, the entire receptor cDNA (radiolabelled) was used as the probe: radiolabeled probe was generated using the complete receptor cDNA (excised from the vector) using a Prime-It II™ Random Primer Labeling Kit (Stratagene, #300385), according to manufacturer's instructions. A human RNA Master Blot™ (Clontech, #7770-1) was hybridized with the GPCR radiolabeled probe and washed under stringent conditions according manufacturer's instructions. The blot was exposed to Kodak BioMax Autoradiography film overnight at - 80°C.

Representative dot-blot format results are presented in Figure 8 for GPR1 (8A), GPR30 (8B), and APJ (8C), with results being summarized for all receptors in Table F

Table F

GPCR	Tissue Distribution (highest levels, relative to other tissues in the dot-blot)
GPR1	Placenta, Ovary, Adrenal

- 70 -

5

10

15

20

GPR4	Broad; highest in Heart, Lung, Adrenal, Thyroid, Spinal Cord
GPR5	Placenta, Thymus, Fetal Thymus Lesser levels in spleen, fetal spleen
GPR7	Liver, Spleen, Spinal Cord, Placenta
GPR8	No expression detected
GPR9-6	Thymus, Fetal Thymus Lesser levels in Small Intestine
GPR18	Spleen, Lymph Node, Fetal Spleen, Testis
GPR20	Broad
GPR21	Broad; very low abundance
GPR22	Heart, Fetal Heart Lesser levels in Brain
GPR30	Stomach
GPR31	Broad
BLR1	Spleen
CEPR	Stomach, Liver, Thyroid, Putamen
EBI1	Pancreas Lesser levels in Lymphoid Tissues
EBI2	Lymphoid Tissues, Aorta, Lung, Spinal Cord
ETBR-LP2	Broad; Brain Tissue
GPCR-CNS	Brain Lesser levels in Testis, Placenta
GPR-NGA	Pituitary Lesser levels in Brain
H9	Pituitary
HB954	Aorta, Cerebellum Lesser levels in most other tissues
HM74	Spleen, Leukocytes, Bone marrow, Mammary Glands, Lung, Trachea
MIG	Low levels in Kidney, Liver, Pancreas, Lung, Spleen
ORG1	Pituitary, Stomach, Placenta
V28	Brain, Spleen, Peripheral Leukocytes

25 Based upon the foregoing information, it is noted that human GPCRs can also be assessed for distribution in diseased tissue; comparative assessments between "normal" and diseased tissue can then be utilized to determine the potential for over-expression or under-expression of a particular receptor in a diseased state. In those circumstances where it is desirable to utilize the non-endogenous versions of the human GPCRs for the purpose of screening to directly identify

- 71 -

candidate compounds of potential therapeutic relevance, it is noted that inverse agonists are useful in the treatment of diseases and disorders where a particular human GPCR is over-expressed, whereas agonists or partial agonists are useful in the treatment of diseases and disorders where a particular human GPCR is under-expressed.

5 As desired, more detailed, cellular localization of the receptors, using techniques well-known to those in the art (e.g., in-situ hybridization) can be utilized to identify particular cells within these tissues where the receptor of interest is expressed.

It is intended that each of the patents, applications, and printed publications mentioned in this patent document be hereby incorporated by reference in their entirety.

10 As those skilled in the art will appreciate, numerous changes and modifications may be made to the preferred embodiments of the invention without departing from the spirit of the invention. It is intended that all such variations fall within the scope of the invention.

Although a variety of expression vectors are available to those in the art, for purposes of utilization for both the endogenous and non-endogenous human GPCRs, it is most preferred that
15 the vector utilized be pCMV. This vector has been deposited with the American Type Culture Collection (ATCC) on October 13, 1998 (10801 University Blvd., Manassas, VA 20110-2209 USA) under the provisions of the Budapest Treaty for the International Recognition of the Deposit of Microorganisms for the Purpose of patent Procedure. The vector was tested by the ATCC on _____, 1998 and determined to be viable on _____, 1998. The ATCC has assigned
20 the following deposit number to pCMV: _____.

- 72 -

CLAIMS

What is claimed is:

1. A constitutively active, non-endogenous version of an endogenous human orphan G protein-coupled receptor (GPCR) comprising the following amino acid residues (carboxy-terminus to amino-terminus orientation) transversing the transmembrane-6 (TM6) and intracellular loop-3 (IC3) regions of the non-endogenous GPCR:

$P^i AA_{15} X$

wherein:

- (1) P^i is an amino acid residue located within the TM6 region of the non-endogenous GPCR, where P^i is selected from the group consisting of (i) the endogenous orphan GPCR proline residue, and (ii) a non-endogenous amino acid residue other than proline;
- (2) AA_{15} are 15 amino acid residues selected from the group consisting of (a) the 15 endogenous amino acid residues of the endogenous orphan GPCR, (b) 15 non-endogenous amino acid residues, and (c) a combination of 15 amino acid residues, the combination comprising at least one endogenous amino acid residue of the endogenous orphan GPCR and at least one non-endogenous amino acid residue, excepting that none of the 15 endogenous amino acid residues that are positioned within the TM6 region of the GPCR is proline; and
- (2) X is a non-endogenous amino acid residue located within the IC3 region of said non-endogenous GPCR.

2. The non-endogenous human GPCR of claim 1 wherein P^i is the endogenous proline

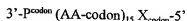
- 73 -

residue.

3. The non-endogenous human GPCR of claim 1 wherein P¹ is a non-endogenous amino acid residue other than a proline residue.
4. The non-endogenous human GPCR of claim 1 wherein AA₁₅ are the 15 endogenous amino acid residues of the endogenous GPCR.
5. The non-endogenous human GPCR of claim 1 wherein X is selected from the group consisting of lysine, histidine, arginine and alanine residues, excepting that when the endogenous amino acid in position X of said endogenous human GPCR is lysine, X is selected from the group consisting of histidine, arginine and alanine.
- 10 6. The non-endogenous human GPCR of claim 1 wherein X is a lysine residue, excepting that when the endogenous amino acid in position X of said endogenous human GPCR is lysine, X is an amino acid other than lysine.
7. The non-endogenous human GPCR of claim 4 wherein X is a lysine residue, excepting that when the endogenous amino acid in position X of said endogenous human GPCR is lysine, X is an amino acid other than lysine.
- 15 8. The non-endogenous, human GPCR of claim 1 wherein P¹ is a proline residue and X is a lysine residue, excepting that when the endogenous amino acid in position X of said endogenous human GPCR is lysine, X is an amino acid other than lysine.
9. A host cell comprising the non-endogenous human GPCR of claim 1.
- 20 10. The material of claim 9 wherein said host cell is of mammalian origin.
11. The non-endogenous human GPCR of claim 1 in a purified and isolated form.
12. A nucleic acid sequence encoding a constitutively active, non-endogenous version of an endogenous human orphan G protein-coupled receptor (GPCR) comprising the following

- 74 -

nucleic acid sequence region transversing the transmembrane-6 (TM6) and intracellular loop-3 (IC3) regions of the orphan GPCR:



wherein:

- 5 (1) P^{codon} is a nucleic acid encoding region within the TM6 region of the non-endogenous GPCR, where P^{codon} encodes an amino acid selected from the group consisting of (i) the endogenous GPCR proline residue, and (ii) a non-endogenous amino acid residue other than proline;
- 10 (2) $(\text{AA-codon})_{15}$ are 15 codons encoding 15 amino acid residues selected from the group consisting of (a) the 15 endogenous amino acid residues of the endogenous orphan GPCR, (b) 15 non-endogenous amino acid residues, and (c) a combination of 15 amino acid residues, the combination comprising at least one endogenous amino acid residue of the endogenous orphan GPCR and at least one non-
15 endogenous amino acid residue, excepting that none of the 15 endogenous amino acid residues that are positioned within the TM6 region of the orphan GPCR is proline; and
- 20 (3) X_{codon} is a nucleic acid encoding region residue located within the IC3 region of said non-endogenous human GPCR, where X_{codon} encodes a non-endogenous amino acid.
13. The nucleic acid sequence of claim 12 wherein P^{codon} encodes an endogenous proline residue.
14. The nucleic acid sequence of claim 12 wherein P^{codon} encodes a non-endogenous

- 75 -

amino acid residue other than a proline residue.

15. The nucleic acid sequence of claim 12 wherein X_{codon} encodes a non-endogenous amino acid selected from the group consisting of lysine, histidine, arginine and alanine, excepting that when the endogenous amino acid in position X of said
5 endogenous human GPCR is lysine, X_{codon} encodes an amino acid selected from the group consisting of histidine, arginine and alanine.
16. The nucleic acid sequence of claim 13 wherein X_{codon} encodes a non-endogenous lysine amino acid excepting that when the endogenous amino acid in position X of said endogenous human GPCR is lysine, X_{codon} encodes an amino acid selected from
10 the group consisting of histidine, arginine and alanine.
17. The nucleic acid sequence of claim 12 wherein X_{codon} is selected from the group consisting of AAA, AAG, GCA, GCG, GCC and GCU.
18. The nucleic acid sequence of claim 12 wherein X_{codon} is selected from the group consisting of AAA and AAG.
- 15 19. The nucleic acid sequence of claim 12 wherein P_{codon} is selected from the group consisting of CCA, CCC, CCG and CCU, and X_{codon} is selected from the group consisting of AAA and AAG.
20. A vector comprising the nucleic acid sequence of claim 12.
21. A plasmid comprising the nucleic acid sequence of claim 12.
- 20 22. A host cell comprising the nucleic acid sequence of claim 21.
23. The nucleic acid sequence of claim 12 in a purified and isolated form.
24. A method for selecting for alteration an endogenous amino acid residue within the third intracellular loop of a human G protein-coupled receptor ("GPCR"), said receptor

- 76 -

comprising a transmembrane 6 region and an intracellular loop 3 region, which endogenous amino acid, when altered to a non-endogenous amino acid, constitutively activates said human GPCR, comprising the following steps:

- 5 (a) identifying an endogenous proline residue within the transmembrane 6 region of a human GPCR;
 - (b) identifying, by moving in a direction of the carboxy-terminus region of said GPCR towards the amino-terminus region of said GPCR, the endogenous, 16th amino acid residue from said proline residue;
 - (c) altering the endogenous residue of step (b) to a non-endogenous amino acid
10 residue to create a non-endogenous version of an endogenous human GPCR;
and
 - (d) determining whether the non-endogenous human GPCR of step (c) is constitutively active.
25. The method of claim 24 wherein the amino acid residue that is two residues from said
15 proline residue in the transmembrane 6 region, in a carboxy-terminus to amino-terminus direction, is tryptophan.
26. A constitutively active, non-endogenous human GPCR produced by the process of claim 24.
27. A constitutively active, non-endogenous human GPCR produced by the process of
20 claim 25.
28. An algorithmic approach for creating a non-endogenous, constitutively active version of an endogenous human G protein coupled receptor (GPCR), said endogenous GPCR comprising a transmembrane 6 region and an intracellular loop 3 region, the

- 77 -

algorithmic approach comprising the steps of:

- (a) selecting an endogenous human GPCR comprising a proline residue in the transmembrane-6 region;
 - (b) identifying, by counting 16 amino acid residues from the proline residue of
5 step (a), in a carboxy-terminus to amino-terminus direction, an endogenous amino acid residue;
 - (c) altering the identified amino acid residue of step (b) to a non-endogenous amino acid residue to create a non-endogenous version of the endogenous human GPCR; and
 - 10 (d) determining if the non-endogenous version of the endogenous human GPCR of step (c) is constitutively active.
29. The algorithmic approach of claim 28 wherein the amino acid residue that is two residues from said proline residue in the transmembrane 6 region, in a carboxy-terminus to amino-terminus direction, is tryptophan.
- 15 30. A constitutively active, non-endogenous human GPCR produced by the algorithmic approach of claim 28.
31. A constitutively active, non-endogenous human GPCR produced by the algorithmic approach of claim 29.
32. A method for directly identifying a compound selected from the group consisting of
20 inverse agonists, agonists and partial agonists to a non-endogenous, constitutively activated human G protein coupled receptor, said receptor comprising a transmembrane-6 region and an intracellular loop-3 region, comprising the steps of:
- (a) selecting an endogenous human GPCR;

- 78 -

- (b) identifying a proline residue within the transmembrane-6 region of the GPCR of step (a);
- (c) identifying, in a carboxy-terminus to amino-terminus direction, the endogenous, 16th amino acid residue from the proline residue of step (b);
- 5 (d) altering the endogenous amino acid of step (c) to a non-endogenous amino acid;
- (e) confirming that the non-endogenous GPCR of step (d) is constitutively active;
- (f) contacting a candidate compound with the non-endogenous, constitutively-activated GPCR of step (e); and
- 10 (g) determining, by measurement of the compound efficacy at said contacted receptor, whether said compound is an inverse agonist, agonist or partial agonist of said receptor.
33. The method of claim 32 wherein the non-endogenous amino acid of step (d) is lysine.
34. A compound directly identified by the method of claim 32.
- 15 35. The method of claim 32 wherein the directly identified compound is an inverse agonist.
36. The method of claim 32 wherein the directly identified compound is an agonist.--
37. The method of claim 32 wherein the directly identified compound is a partial agonist.
38. A composition comprising the inverse agonist of claim 35.
- 20 39. A composition comprising the agonist of claim 36.
40. A composition comprising the partial agonist of claim 37.
41. A method for directly identifying an inverse agonist to a non-endogenous,

- 79 -

constitutively activated human G protein coupled receptor ("GPCR"), said GPCR comprising a transmembrane-6 region and an intracellular loop-3 region, comprising the steps of:

- (a) selecting an endogenous human GPCR;
 - (b) identifying a proline residue within the transmembrane-6 region of the GPCR of
5 step (a);
 - (c) identifying, in a carboxy-terminus to amino-terminus direction, the endogenous, 16th amino acid residue from the proline residue of step (b);
 - (d) altering the endogenous amino acid of step (c) to a non-endogenous lysine residue;
 - (e) confirming that the non-endogenous GPCR of step (d) is constitutively active;
 - 10 (f) contacting a candidate compound with the non-endogenous, constitutively-activated GPCR of step (e); and
 - (g) determining, by measurement of the compound efficacy at said contacted receptor, whether said compound is an inverse agonist of said receptor.
42. An inverse agonist directly identified by the method of claim 37.
- 15 43. A composition comprising an inverse agonist of claim 38.

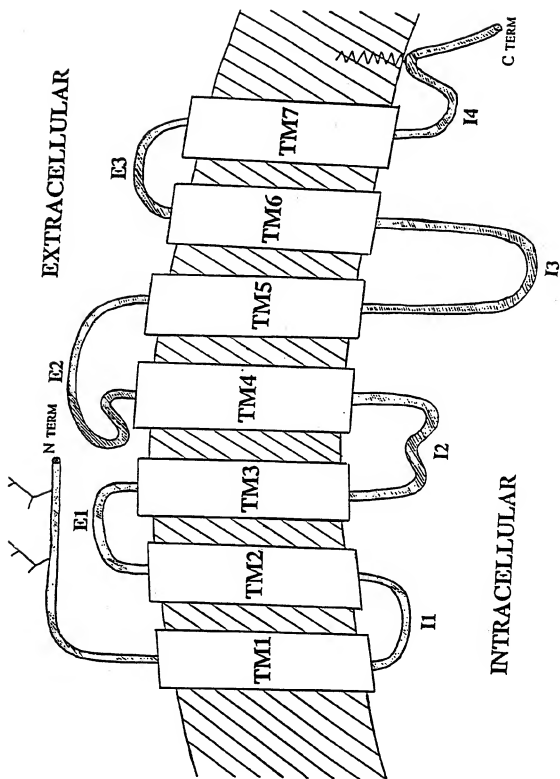


FIGURE 1

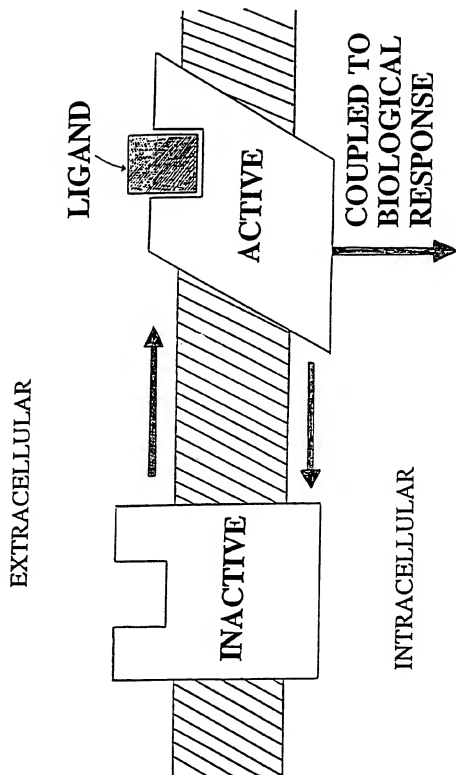


FIGURE 2

pCMV Sequence and Restriction Site

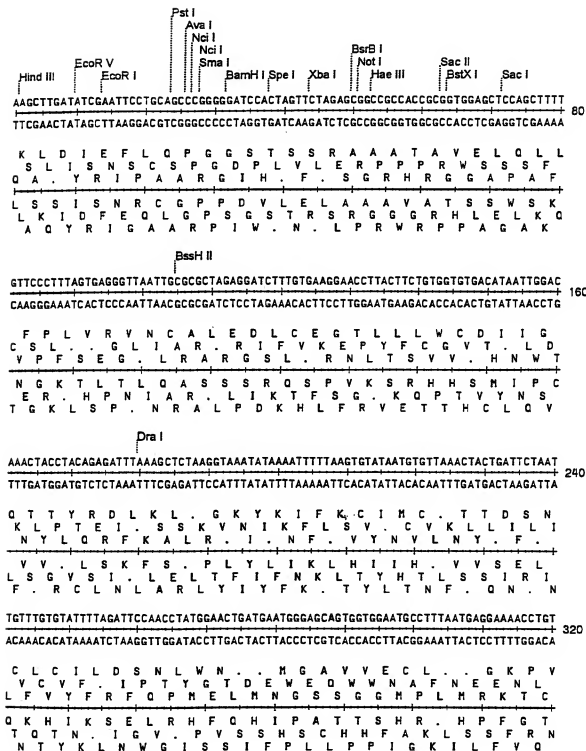


FIGURE 3A

TTTGCTCAGAAGAAATGCCATCTAGTGATGATGAGGCTACTGCTGACTCTCAACATTCTACTCTCCAAAAAAGAAGAGA 400
AAACGAGCTCTCTTACGGTAGACTACTACTCTCGATGACGACTGAGAGTTGTAAGATGAGGAGGTTTTTCTCTCTCT

L L R R N A I G Y C . L S T F Y S S K K E E
F C S E E M P S S D D E A T A D S Q H S T P P K K K R
F A Q K K C H L V M M R L L L T L N I L L L Q K R R E
K S L L F A M . H H H P . Q O S E V N . E E L F S S F
Q E S S I G D L S S S A V A S E . C E V G G G F F F L
K A . F F H W R T I I L S S S V R L M R S R W F L L S

Sty I

AAGGTAGAAGACCAAGGACTTTCTCTCAGAATTGCTAAGTTTTTTGAGTCATGCTGTGTTTAGTAATAGAAGCTTTGC 480
TTCCATCTTCTGGGGTTCTGAAAGGAAGTCTTAACGATTCAAAAACTCAGTACGACACAAATCATTTATCTGAGAAGC

K G R R P Q G L S F R I A K F F E S C C V N S C
K V E D P K D F P S E L L S F L S H A V F S N R I L A
R . K T P R T F L Q N C . V F . V M L C L V I E L L
P L L G W P S E K L I A L N K S D H O T . Y Y F E Q
F T S S G L S K G E S N S L K K L . A T N L L L V R A
L Y F V G L V K R . F O . T K O T M S H K T I S S K S

TTGCTTTGCTATTTACACCACAAAGGAAAAAGCTGCACTGCTATACAAGAAATTTATGGAATAATTTCTGTAACCTTTA 560
AACGAACGATAAATGTGGTGTTCTCTTTTCGACGTGACGATATGTTCTTTAATACCTTTTATAAGACATTGGAAT

L L C A I Y L H H K G K S C T A I Q E N Y G K I F C N L Y
L C F A I Y T T K E K A A L L Y K K I M E K I V S N T F
L A L L F T P Q R K K L H C Y T R K L W K N I L . P L
K S Q . K C W L P F L Q V A I C S F . P F I N Q L R .
Q K A I . V V F S F A A S S Y L F I I S F Y E T V K I
A K S N V G C L F F S C Q . V L F N H F F I R Y G K

Ase I

TAAGTAGGCATAACAGTATAATCATAACACTGTTTTTTCTTACTCCACACAGGCATAGAGTGCTGCTATTATAAAC 640
ATTCATCCGTATTGTCAATATTAGTATTGTATGACAAAAAGAATGAGGTGTGTCGGTATCTCACAGACGATAATTATTG

K . A . Q L . S . H T V F S Y S T Q A . S V C Y . .
I S R H N S Y N H N I L F F L T P H R H R V S A I N .
V G I T V I I I T Y C F F L L H T G I E C L L L I T
L Y A Y C N Y D Y C V T K E . E V C A Y L T Q . . Y S
L L C L L . L . L M S N K R V G C L C L T D A I L Y
Y T P H V T I I M V Y Q K K K S W V P M S H R S N I V

Rsa I

TATGCTCAAAATTTGTGTACCTTTTAGCTTTTTAATTTGTAAGGGGTAAATAAGGAATATTTGATGTATAGTGCCTTGAC 720
ATACGAGTTTTTAACACATGGAATCGAAAAATTAACATTTCCTCAATTATCTCTATAAATACATATCACGGAAGCTG

L C S K I V Y L . L F N L . R G . . G I F D V . C L D
Y A Q K I L C T F S F L I C K G V N K E Y L H Y S A L T
M L K N C V P L A F . F V K G L I R N I . C I V P .
H E F I T Y R . S K L K Y L P . Y P I N S T Y H R S
A . F N H V K L K K I Q L P T L L S Y K I Y L A K V
I S L F Q T G K A K . N T F P N I L F I Q H I T G Q S

FIGURE 3B

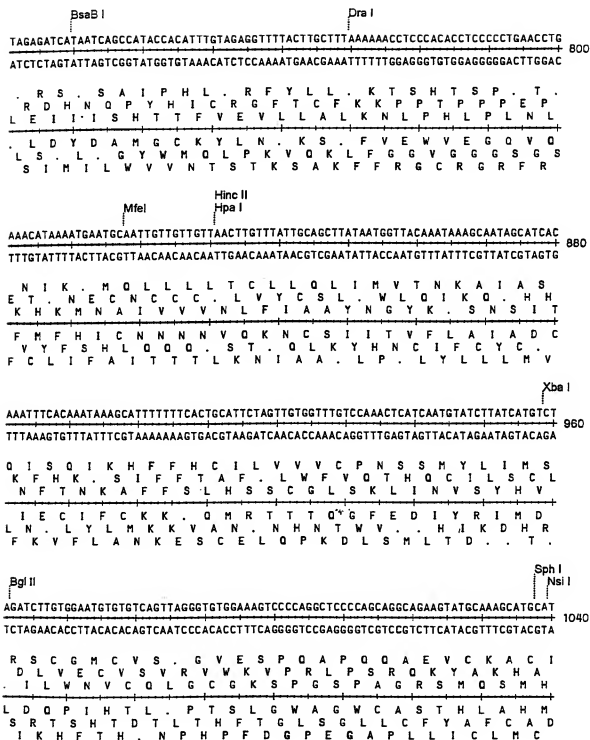


FIGURE 3C

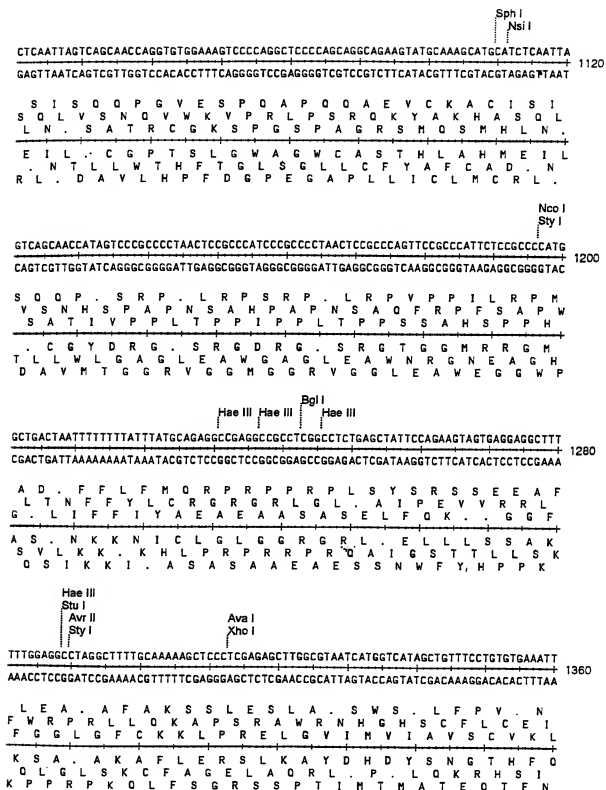


FIGURE 3D

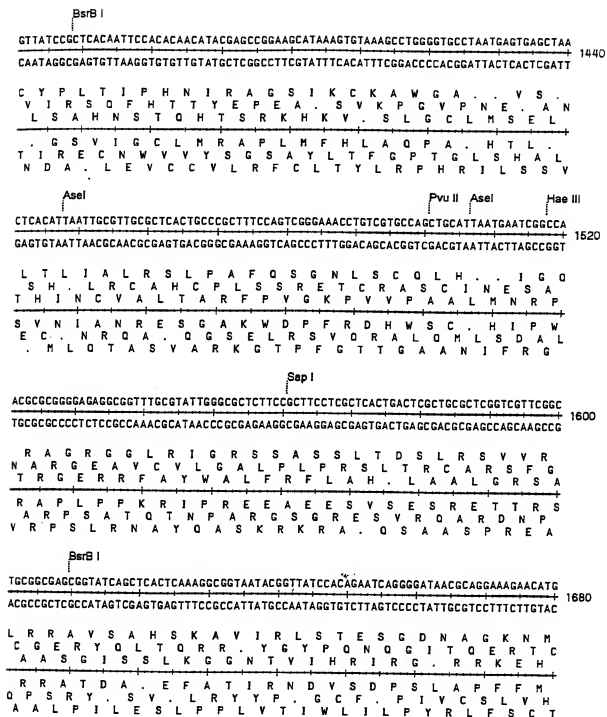


FIGURE 3E

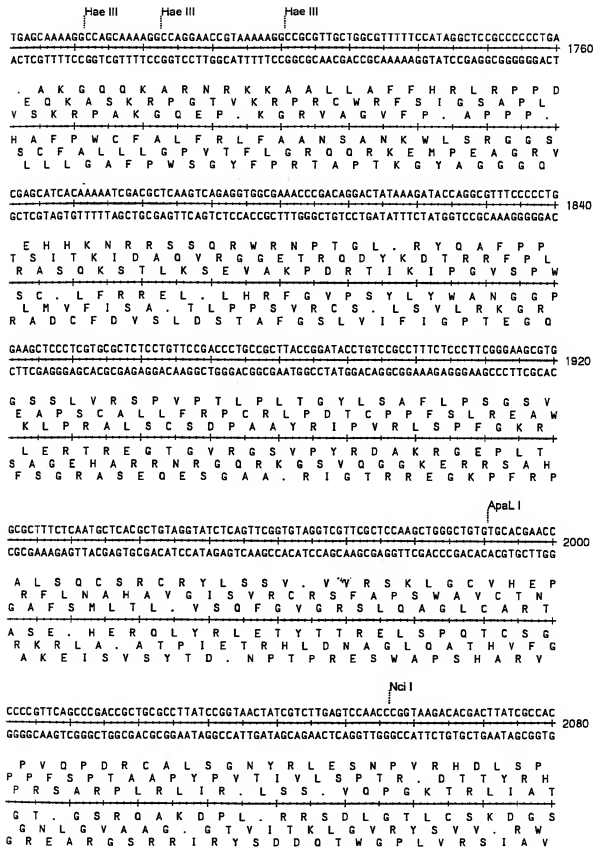


FIGURE 3F

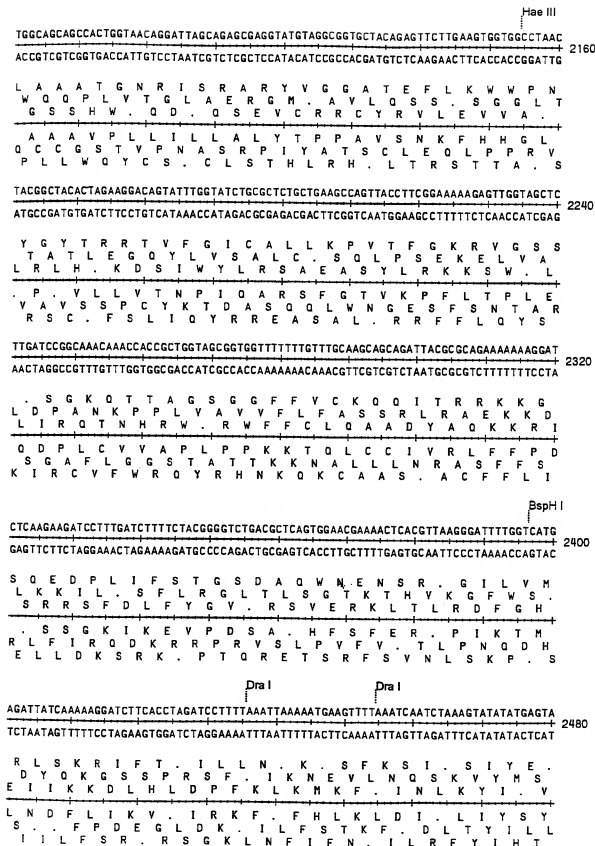


FIGURE 3g

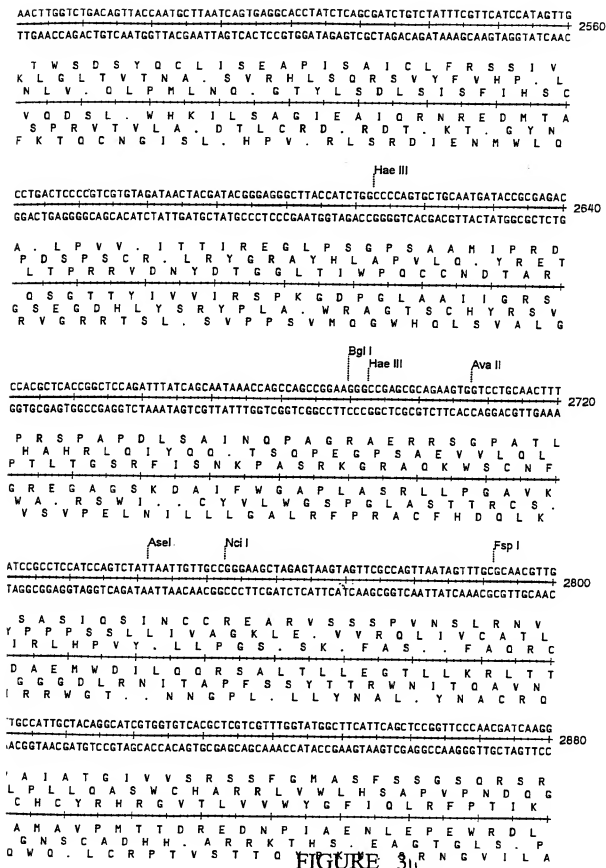


FIGURE 34

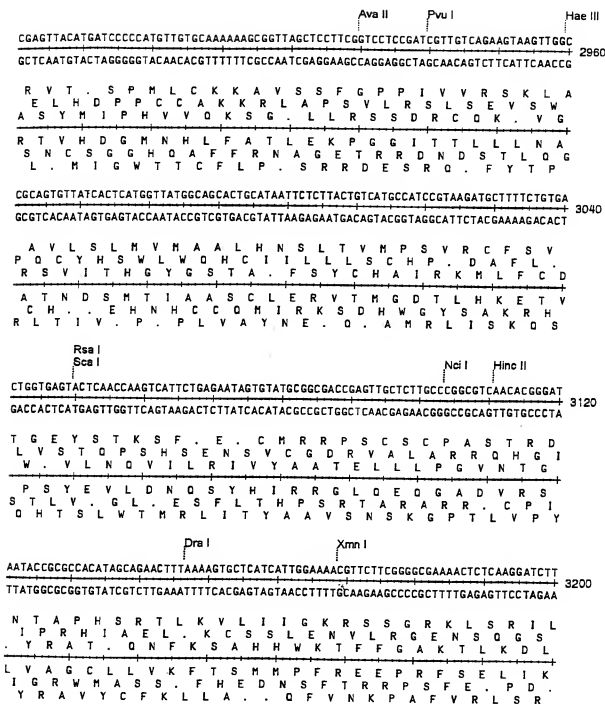


FIGURE 3I

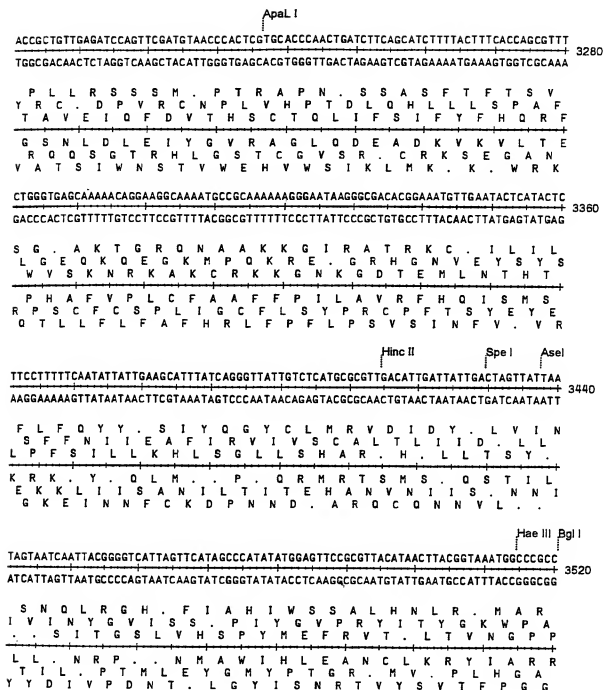


FIGURE 3J

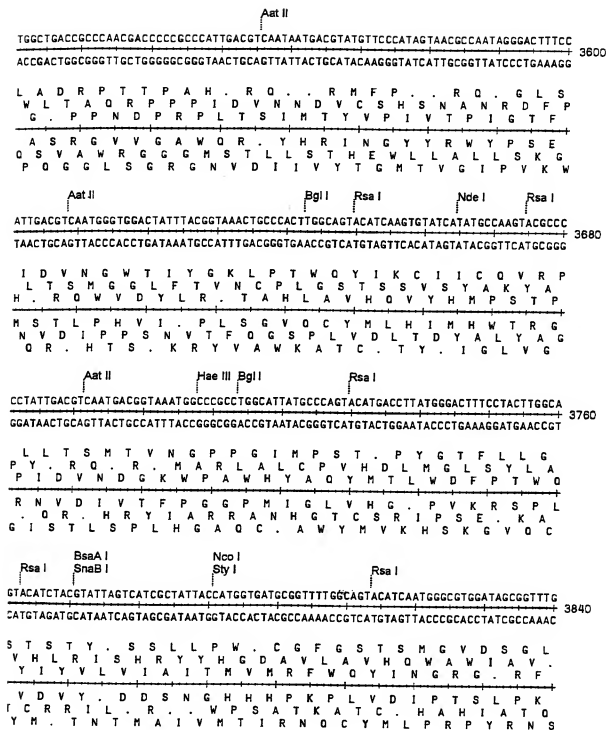


FIGURE 3K

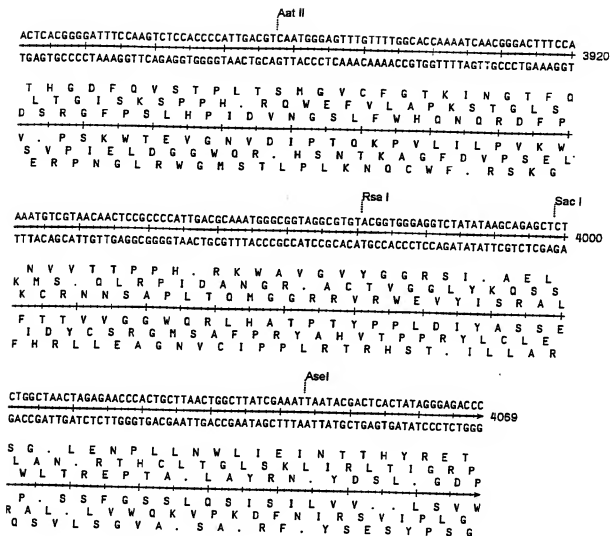


FIGURE 3L

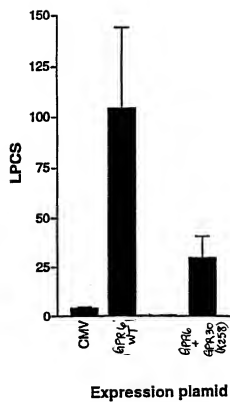


FIGURE 4

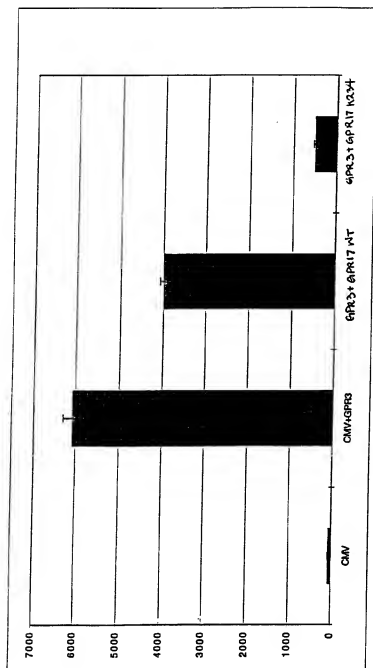


FIGURE 5

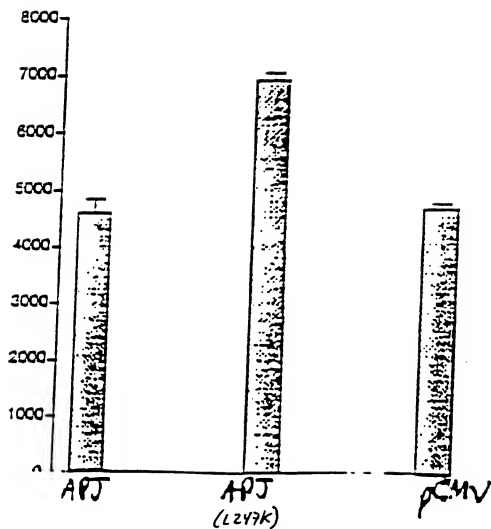


FIGURE 6

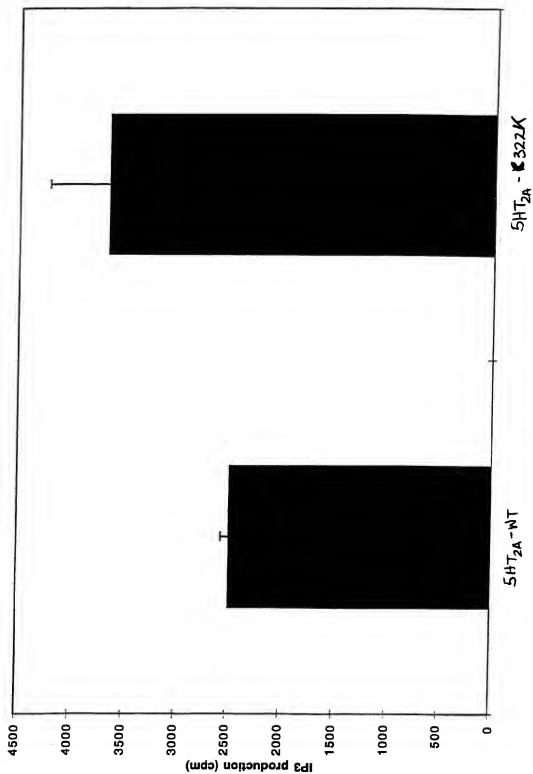


FIGURE 7

FIGURE 8A

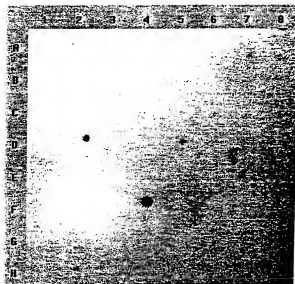


FIGURE 8B

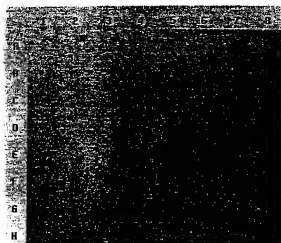
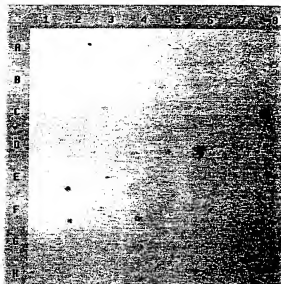


FIGURE 8C

1

SEQUENCE LISTING

(1) GENERAL INFORMATION:

- 5 (i) APPLICANT: Behan, Dominic P.
Chalmers, Derek T.
Liaw, Chen W.
- (ii) TITLE OF INVENTION: Non-Endogenous, Constitutively
Activated Human G Protein-Coupled
Orphan Receptors
- 10 (iii) NUMBER OF SEQUENCES: 280
- (iv) CORRESPONDENCE ADDRESS:
(A) ADDRESSEE: Arena Pharmaceuticals, Inc.
(B) STREET: 6166 Nancy Ridge Drive
15 (C) CITY: San Diego
(D) STATE: CA
(E) COUNTRY: USA
(F) ZIP: 92122
- (v) COMPUTER READABLE FORM:
(A) MEDIUM TYPE: Floppy disk
20 (B) COMPUTER: IBM PC compatible
(C) OPERATING SYSTEM: PC-DOS/MS-DOS
(D) SOFTWARE: PatentIn Release #1.0, Version #1.30
- (vi) CURRENT APPLICATION DATA:
25 (A) APPLICATION NUMBER: US
(B) FILING DATE:
(C) CLASSIFICATION:
- (vii) ATTORNEY/AGENT INFORMATION:
(A) NAME: Burgoon, Richard P.
(B) REGISTRATION NUMBER: 34,787
- 30 (ix) TELECOMMUNICATION INFORMATION:
(A) TELEPHONE: (619) 453-7200
(B) TELEFAX: (619) 453-7210

(2) INFORMATION FOR SEQ ID NO:1:

- 35 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 1068 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- 40 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:1:

ATGGAAGATT TGGAGGAAAC ATTATTGAA GAATTGAAA ACTATTCTTA TGACCTAGAC

60

	TATTACTCTC	TGGAGTCTGA	TTTGGAGGAG	AAAGTCCAGC	TGGGAGTTGT	TCACTGGGTC	120
	TCCCTGGTGT	TATAATTGTTT	GGCTTTTGT	CTGGGAATTC	CAGGAAATGC	CATCGTCATT	180
	TGGTTCACGG	GGCTCAAGTG	GAAGAAGACA	GTCACCACTC	TGTGGTTTCCT	CAATCTAGCC	240
	ATTGCGGATT	TCATTTTCT	TCTCTTCTG	CCCCTGTACA	TCTCCTATGT	GGCCTGAAT	300
5	TTCCACTGGC	CCTTTGGCAT	CTGGCTGTGC	AAAGCCAATT	CCTTCACTGC	CCAGTTGAAC	360
	ATGTTTGCCA	GTGTTTTTTT	CCTGACAGTG	ATCAGCCTGG	ACCACTATAT	CCACTTGATC	420
	CATCCTGTCT	TATCTCATCG	GCATCGAACC	CTCAAGAACT	CTCTGATTGT	CATTATATTC	480
	ATCTGGCTTT	TGGCTTCTCT	AATTGGCGGT	CCTGCCCTGT	ACTTCCGGGA	CACTGTGGAG	540
	TTCAATAATC	ATACTCTTTG	CTATAACAAT	TTTCAGAAGC	ATGATCCTGT	CCTCACTTTG	600
10	ATCAGGCACC	ATGTTCTGAC	TGGGGTGAAA	TTTATCATTG	GCTATCTCTT	CCCTTTGCTA	660
	ACAATGAGTA	TTTGCTACTT	GTGTCTCATC	TTCAAGGTGA	AGAAGCGAAC	AGTCCTGATC	720
	TCCAGTAGGC	ATTTCTGGAC	AATTCTGGTT	GTGGTTGTGG	CCTTTGTGTT	TTGCTGGACT	780
	CCTTATCACC	TGTTTAGCAT	TTGGGAGCTC	ACCATTCAAC	ACAATAGCTA	TTCCCACCAT	840
	GTGATGCAGG	CTGGAATCCC	CCTCTCCACT	GGTTTGGCAT	TCCTCAATAG	TTGCTTGAAC	900
15	CCCATCCTTT	ATGTCCTAAT	TAGTAAGAAG	TTCCAAGCTC	GCTTCCGGTC	CTCAGTTGCT	960
	GAGATACTCA	AGTACACACT	GTGGGAAGTC	AGCTGTTCTG	GCACAGTGAG	TGAACAGCTC	1020
	AGGAACTCAG	AAACCAAGAA	TCTGTGTCTC	CTGGAAACAG	CTCAATAA		1068

(3) INFORMATION FOR SEQ ID NO:2:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 355 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:2:

Met Glu Asp Leu Glu Glu Thr Leu Phe Glu Glu Phe Glu Asn Tyr Ser
1 5 10 15

Tyr Asp Leu Asp Tyr Tyr Ser Leu Glu Ser Asp Leu Glu Glu Lys Val
20 25 30

Gln Leu Gly Val Val His Trp Val Ser Leu Val Leu Tyr Cys Leu Ala
35 40 45

Phe Val Leu Gly Ile Pro Gly Asn Ala Ile Val Ile Trp Phe Thr Gly
 50 55 60

Leu Lys Trp Lys Lys Thr Val Thr Thr Leu Trp Phe Leu Asn Leu Ala
 65 70 75 80

5 Ile Ala Asp Phe Ile Phe Leu Leu Phe Leu Pro Leu Tyr Ile Ser Tyr
 85 90 95

Val Ala Met Asn Phe His Trp Pro Phe Gly Ile Trp Leu Cys Lys Ala
 100 105 110

10 Asn Ser Phe Thr Ala Gln Leu Asn Met Phe Ala Ser Val Phe Phe Leu
 115 120 125

Thr Val Ile Ser Leu Asp His Tyr Ile His Leu Ile His Pro Val Leu
 130 135 140

Ser His Arg His Arg Thr Leu Lys Asn Ser Leu Ile Val Ile Ile Phe
 145 150 155 160

15 Ile Trp Leu Leu Ala Ser Leu Ile Gly Gly Pro Ala Leu Tyr Phe Arg
 165 170 175

Asp Thr Val Glu Phe Asn Asn His Thr Leu Cys Tyr Asn Asn Phe Gln
 180 185 190

20 Lys His Asp Pro Asp Leu Thr Leu Ile Arg His His Val Leu Thr Trp
 195 200 205

Val Lys Phe Ile Ile Gly Tyr Leu Phe Pro Leu Leu Thr Met Ser Ile
 210 215 220

Cys Tyr Leu Cys Leu Ile Phe Lys Val Lys Lys Arg Thr Val Leu Ile
 225 230 235 240

25 Ser Ser Arg His Phe Trp Thr Ile Leu Val Val Val Val Ala Phe Val
 245 250 255

Val Cys Trp Thr Pro Tyr His Leu Phe Ser Ile Trp Glu Leu Thr Ile
 260 265 270

30 His His Asn Ser Tyr Ser His His Val Met Gln Ala Gly Ile Pro Leu
 275 280 285

Ser Thr Gly Leu Ala Phe Leu Asn Ser Cys Leu Asn Pro Ile Leu Tyr
 290 295 300

Val Leu Ile Ser Lys Lys Phe Gln Ala Arg Phe Arg Ser Ser Val Ala
 305 310 315 320

35 Glu Ile Leu Lys Tyr Thr Leu Trp Glu Val Ser Cys Ser Gly Thr Val
 325 330 335

Ser Glu Gln Leu Arg Asn Ser Glu Thr Lys Asn Leu Cys Leu Leu Glu

340

345

350

Thr Ala Gln
355

(4) INFORMATION FOR SEQ ID NO:3:

- 5 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 1089 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

- 10 (ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:3:

	ATGGGCAACC	ACACGTGGGA	GGGCTGCCAC	GTGGACTCGC	GCGTGGACCA	CCTCTTCCG	60
	CCATCCCTCT	ACATCTTGT	CATCGGCGTG	GGGCTGCCCA	CCAACTGCCT	GGCTCTGTGG	120
	GCGGCCTACC	GCCAGGTGCA	ACAGCGCAAC	GAGCTGGGCG	TCTACCTGAT	GAACCTCAGC	180
15	ATCGCCGACC	TGCTGTACAT	CTGCACGCTG	CCGCTGTGGG	TGGACTACTT	CCTGCACCAC	240
	GACAACTGGA	TCCACGGCCC	CGGGTCTGTC	AAGCTCTTTG	GSTTCATCTT	CTACACCAAT	300
	ATCTACATCA	GCATCGCCTT	CCTGTGCTGC	ATCTCGGTGG	ACCGCTACCT	GGCTGTGGCC	360
	CACCCACTCC	GCTTCGCCCC	CCTGCGCGCG	GTCAAGACCG	CCGTGGCCGT	GAGCTCCGTG	420
	GTCTGGGCCA	CGGAGCTGGG	CGCCAACTCG	GCGCCCCTGT	TCCATGACGA	GCTCTTCCGA	480
20	GACCGCTACA	ACCACACCTT	CTGCTTTGAG	AAGTTCCCCA	TGGAAGGCTG	GGTGGCCTGG	540
	ATGAACCTCT	ATCGGGTGTT	CGTGGGCTTC	CTCTTCCCGT	GGGCGCTCAT	GCTGCTGTCTG	600
	TACCGGGGCA	TCCTGCGGGC	CGTGCGGGGC	AGCGTGTCCA	CCGAGCGCCA	GGAGAAGSCC	660
	AAGATCAAGC	GGCTGGCCCT	CAGCCTCATC	GCCATCGTGC	TGGTCTGCTT	TGCGCCCTAT	720
	CACGTGCTCT	TGCTGTCCCG	CAGCGCCATC	TACCTGGGCC	GCCCTGGGGA	CTGCGGCTTC	780
25	GAGGAGCGCG	TCCTTTCTGC	ATACCACAGC	TCACTGGCTT	TCACCAGCCT	CAACTGTGTG	840
	GCGGACCCCA	TCCTCTACTG	CCTGGTCAAC	GAGGGCGCCC	GCAGCGATGT	GGCCAAGGCC	900
	CTGCACAACC	TGCTCCGCTT	TCTGGCCAGC	GACAAGCCCC	AGGAGATGGC	CAATGCCTCG	960
	CTCACCTGTG	AGACCCCACT	CACCTCCAAG	AGGAACAGCA	CAGCCAAGAC	CATGACTGGC	1020
	AGCTGGGCGG	CCACTCCGCC	TTCCCAGGGG	GACCAGGTGC	AGCTGAAGAT	GCTGCCGCCA	1080
30	GCACAATGA						1089

(5) INFORMATION FOR SEQ ID NO:4:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 362 amino acids

(B) TYPE: amino acid

(C) STRANDEDNESS:

(D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:4:

Met Gly Asn His Thr Trp Glu Gly Cys His Val Asp Ser Arg Val Asp
 1 5 10 15
 His Leu Phe Pro Pro Ser Leu Tyr Ile Phe Val Ile Gly Val Gly Leu
 20 25 30
 Pro Thr Asn Cys Leu Ala Leu Trp Ala Ala Tyr Arg Gln Val Gln Gln
 35 40 45
 Arg Asn Glu Leu Gly Val Tyr Leu Met Asn Leu Ser Ile Ala Asp Leu
 50 55 60
 Leu Tyr Ile Cys Thr Leu Pro Leu Trp Val Asp Tyr Phe Leu His His
 65 70 75 80
 Asp Asn Trp Ile His Gly Pro Gly Ser Cys Lys Leu Phe Gly Phe Ile
 85 90 95
 Phe Tyr Thr Asn Ile Tyr Ile Ser Ile Ala Phe Leu Cys Cys Ile Ser
 100 105 110
 Val Asp Arg Tyr Leu Ala Val Ala His Pro Leu Arg Phe Ala Arg Leu
 115 120 125
 Arg Arg Val Lys Thr Ala Val Ala Val Ser Ser Val Val Trp Ala Thr
 130 135 140
 Glu Leu Gly Ala Asn Ser Ala Pro Leu Phe His Asp Glu Leu Phe Arg
 145 150 155 160
 Asp Arg Tyr Asn His Thr Phe Cys Phe Glu Lys Phe Pro Met Glu Gly
 165 170 175
 Trp Val Ala Trp Met Asn Leu Tyr Arg Val Phe Val Gly Phe Leu Phe
 180 185 190
 Pro Trp Ala Leu Met Leu Leu Ser Tyr Arg Gly Ile Leu Arg Ala Val
 195 200 205
 Arg Gly Ser Val Ser Thr Glu Arg Gln Glu Lys Ala Lys Ile Lys Arg
 210 215 220
 Leu Ala Leu Ser Leu Ile Ala Ile Val Leu Val Cys Phe Ala Pro Tyr

6

	225		230		235		240
	His Val Leu	Leu Leu Ser Arg Ser Ala Ile Tyr Leu Gly Arg Pro Trp					
		245		250		255	
5	Asp Cys Gly Phe Glu Glu Arg Val Phe Ser Ala Tyr His Ser Ser Leu						
		260		265		270	
	Ala Phe Thr Ser Leu Asn Cys Val Ala Asp Pro Ile Leu Tyr Cys Leu						
		275		280		285	
	Val Asn Glu Gly Ala Arg Ser Asp Val Ala Lys Ala Leu His Asn Leu						
		290		295		300	
10	Leu Arg Phe Leu Ala Ser Asp Lys Pro Gln Glu Met Ala Asn Ala Ser						
		305		310		315	
	Leu Thr Leu Glu Thr Pro Leu Thr Ser Lys Arg Asn Ser Thr Ala Lys						
		325		330		335	
	Ala Met Thr Gly Ser Trp Ala Ala Thr Pro Pro Ser Gln Gly Asp Gln						
15		340		345		350	
	Val Gln Leu Lys Met Leu Pro Pro Ala Gln						
		355		360			

(6) INFORMATION FOR SEQ ID NO:5:

- 20 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 30 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- 25 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:5:

TATGAATTCA GATGCTCTAA ACGTCCCTGC 30

(7) INFORMATION FOR SEQ ID NO:6:

- 30 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 30 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:6:

35 TCCGGATCCA CCTGCACCTG CGCCTGCACC 30

(8) INFORMATION FOR SEQ ID NO: 7:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 1002 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:7:

ATGGAGTCCT CAGGCAACCC AGAGAGCACC ACCTTTTTTT ACTATGACCT TCAGAGCCAG 60
 CCGTGTGAGA ACCAGGCCTG GGTCTTTGCT ACCCTCGCCA CCACTGTCCT GTACTGCCTG 120
 10 GTGTTTCTCC TCAGCCTAGT GGGCAACAGC CTGGTCCTGT GGGTCCTGGT GAAGTATGAG 180
 AGCCTGGAGT CCCTACCAA CATCTTCATC CTC AACCTGT GCCTCTCAGA CCTGGTGTTC 240
 GCCTGCTTGT TGCGTGTGTG GATCTCCCA TACCACTGGG GCTGGGTGCT GGGAGACTTC 300
 CTCTGCAAAAC TCCTCAATAT GATCTTCTCC ATCAGCCTCT ACAGCAGCAT CTCTTCTCTG 360
 ACCATCATGA CCATCCACCG CTACCTGTGC GTAGTGAGCC CCTCTCCAC CCTGCGCGTC 420
 15 CCCACCCTCC GCTGCGGGT GCTGGTGACC ATGGCTGTGT GGGTAGCCAG CATCCTGTTC 480
 TCCATCCTCG ACACCATCTT CCACAAGGTG CTTTCTTCGG GCTGTGATTA TTCGGAATC 540
 ACGTGGTACC TCACCTCCGT CTACCAAGCAC AACCTCTTCT TCCTGCTGTC CCTGGGGATT 600
 ATCCTGTCTT GCTACGTGGA GATCCTCAGG ACCCTGTTC GCTCACGCTC CAAGCGGCGC 660
 CACCGCACGG TCAAGCTCAT CTTCCGCATC GTGGTGGCCT ACTTCCTCAG CTGGGGTCCC 720
 20 TACAATTCA CCCTGTTTCT GCAGACGCTG TTTGGGACCC AGATCATCCG GAGCTGCGAG 780
 GCCAAACAGC AGCTAGAATA CGCCCTGCTC ATCTGCCGCA ACCTCGCCTT CTCCCACTGC 840
 TGCTTTAACC CGGTGCTCTA TGTCTTCGTG GGGGTCAAGT TCCGCACACA CCTGAAACAT 900
 GTTCTCCGGC AGTTCGTGTT CTGCCGGCTG CAGGCACCCA GCCCAGCCTC GATCCCCAC 960
 TCCCTGGTG CCTTCGCCTA TGAGGGCGCC TCCTTCTACT GA 1002

(9) INFORMATION FOR SEQ ID NO:8:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 333 amino acids

(B) TYPE: amino acid

(C) STRANDEDNESS:

(D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:8:

	Met	Glu	Ser	Ser	Gly	Asn	Pro	Glu	Ser	Thr	Thr	Phe	Phe	Tyr	Tyr	Asp	
	1				5					10					15		
	Leu	Gln	Ser	Gln	Pro	Cys	Glu	Asn	Gln	Ala	Trp	Val	Phe	Ala	Thr	Leu	
				20					25					30			
5	Ala	Thr	Thr	Val	Leu	Tyr	Cys	Leu	Val	Phe	Leu	Leu	Ser	Leu	Val	Gly	
				35				40					45				
	Asn	Ser	Leu	Val	Leu	Trp	Val	Leu	Val	Lys	Tyr	Glu	Ser	Leu	Glu	Ser	
			50				55					60					
10	Leu	Thr	Asn	Ile	Phe	Ile	Leu	Asn	Leu	Cys	Leu	Ser	Asp	Leu	Val	Phe	
	65			70						75				80			
	Ala	Cys	Leu	Leu	Pro	Val	Trp	Ile	Ser	Pro	Tyr	His	Trp	Gly	Trp	Val	
				85					90					95			
	Leu	Gly	Asp	Phe	Leu	Cys	Lys	Leu	Leu	Asn	Met	Ile	Phe	Ser	Ile	Ser	
				100				105						110			
15	Leu	Tyr	Ser	Ser	Ile	Phe	Phe	Leu	Thr	Ile	Met	Thr	Ile	His	Arg	Tyr	
				115				120						125			
	Leu	Ser	Val	Val	Ser	Pro	Leu	Ser	Thr	Leu	Arg	Val	Pro	Thr	Leu	Arg	
				130			135						140				
20	Cys	Arg	Val	Leu	Val	Thr	Met	Ala	Val	Trp	Val	Ala	Ser	Ile	Leu	Ser	
	145					150					155				160		
	Ser	Ile	Leu	Asp	Thr	Ile	Phe	His	Lys	Val	Leu	Ser	Ser	Gly	Cys	Asp	
				165						170				175			
	Tyr	Ser	Glu	Leu	Thr	Trp	Tyr	Leu	Thr	Ser	Val	Tyr	Gln	His	Asn	Leu	
				180					185					190			
25	Phe	Phe	Leu	Leu	Ser	Leu	Gly	Ile	Ile	Leu	Phe	Cys	Tyr	Val	Glu	Ile	
			195				200						205				
	Leu	Arg	Thr	Leu	Phe	Arg	Ser	Arg	Ser	Lys	Arg	Arg	His	Arg	Thr	Val	
			210			215						220					
30	Lys	Leu	Ile	Phe	Ala	Ile	Val	Val	Ala	Tyr	Phe	Leu	Ser	Trp	Gly	Pro	
	225					230					235				240		
	Tyr	Asn	Phe	Thr	Leu	Phe	Leu	Gln	Thr	Leu	Phe	Arg	Thr	Gln	Ile	Ile	
				245					250					255			
	Arg	Ser	Cys	Glu	Ala	Lys	Gln	Gln	Leu	Glu	Tyr	Ala	Leu	Leu	Ile	Cys	
				260					265					270			
35	Arg	Asn	Leu	Ala	Phe	Ser	His	Cys	Cys	Phe	Asn	Pro	Val	Leu	Tyr	Val	
			275				280						285				

Phe Val Gly Val Lys Phe Arg Thr His Leu Lys His Val Leu Arg Gln
 290 295 300

Phe Trp Phe Cys Arg Leu Gln Ala Pro Ser Pro Ala Ser Ile Pro His
 305 310 315 320

5 Ser Pro Gly Ala Phe Ala Tyr Glu Gly Ala Ser Phe Tyr
 325 330

(10) INFORMATION FOR SEQ ID NO:9:

(i) SEQUENCE CHARACTERISTICS:

- 10 (A) LENGTH: 30 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:9:

15 GCAAGCTTGG GGGACGCCAG GTCGCCGGCT 30

(11) INFORMATION FOR SEQ ID NO:10:

(i) SEQUENCE CHARACTERISTICS:

- 20 (A) LENGTH: 31 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:10:

GCGGATCCGG ACGCTGGGGG AGTCAGGCTG C 31

25 (12) INFORMATION FOR SEQ ID NO:11:

(i) SEQUENCE CHARACTERISTICS:

- 30 (A) LENGTH: 987 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:11:

ATGGACAACG CCTCGTCTC GGAGCCCTGG CCGCCAACG CATCGGGCCC GGACCCGGCG 60

CTGAGCTGCT CCAACGCGTC GACTCTGGCG CCGTGCCGG CGCGCTGGC GGTGGCTGTA 120

35 CCAGTTGTCT ACGCGGTGAT CTGCGCCGTG GGTCTGGCGG GCAACTCCGC CGTGCTGTAC 180

GTGTGTGCTGC GGGCGCCCCG CATGAAGACC GTCACCAACC TGTTCATCCT CAACCTGGCC 240
 ATCGCCGACG AGCTCTTCAC GCTGGTGCTG CCCATCAACA TCGCCGACTT CCTGCTGCGG 300
 CAGTGGCCCT TCGGGGAGCT CATGTGCAAG CTCATCGTGG CTATCGACCA GTACAACACC 360
 TTCTCCAGCC TCTACTTCCT CACCCTCATG AGCGCCGACC GCTACCTGGT GGTGTGGGCC 420
 5 ACTCGCGAGT CGCGCCGGGT GGCCGGCGCG ACCTACAGCG CCGCGCGCGC GGTGAGCCTG 480
 GCCGTGTGGG GGATCGTCAC ACTCGTCGTG CTGCCCTTCG CAGTCTTCGC CGCGCTAGAC 540
 GACGAGCAGG GCCGGCGCCA GTGCGTGCTA GTCTTCCGC AGCCCGAGGC CTCTTGGTGG 600
 CGCGCGAGCC GCCTCTACAC GCTCGTGCTG GGCTTCGCCA TCCCGTGTG CACCATCTGT 660
 GTCCTCTATA CCACCTGCTG GTGCCGGCTG CATGCCATGC GGCTGGACAG CCACGCCAAG 720
 10 GCCCTGGAGC GCGCCAAGAA GCGGGTGACC TTCCTGGTGG TGGCAATCCT GCGCGGTGTG 780
 CTCCTCTGCT GGAAGCCCTA CCACCTGAGC ACCGTGGTGG CGCTACCAC CGACCTCCCG 840
 CAGACGCCGC TGGTCATCGC TATCTCTAC TTCATCACC GCCTGACGTA CGCCAACAGC 900
 TGCCTCAACC CCTTCTCTA CGCCTTCTG GACGCCAGCT TCCGCAGGAA CCTCCGCCAG 960
 CTGATAACTT GCCGCGCGGC AGCCTGA 987

15 (13) INFORMATION FOR SEQ ID NO:12:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 328 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 20 (D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:12:

Met Asp Asn Ala Ser Phe Ser Glu Pro Trp Pro Ala Asn Ala Ser Gly
 1 5 10 15
 25 Pro Asp Pro Ala Leu Ser Cys Ser Asn Ala Ser Thr Leu Ala Pro Leu
 20 25 30
 Pro Ala Pro Leu Ala Val Ala Val Pro Val Val Tyr Ala Val Ile Cys
 35 40 45
 30 Ala Val Gly Leu Ala Gly Asn Ser Ala Val Leu Tyr Val Leu Leu Arg
 50 55 60
 Ala Pro Arg Met Lys Thr Val Thr Asn Leu Phe Ile Leu Asn Leu Ala
 65 70 75 80

[illegible]

(14) INFORMATION FOR SEO ID NO:13:

35 (1) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 30 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:13:

CGGAATTCGT CAACGGTCCC AGCTACAATG 30

(15) INFORMATION FOR SEQ ID NO:14:

- 5 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 31 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

10 (ii) MOLECULE TYPE: DNA (genomic)
 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:14:

ATGGATCCCA GGCCCTTCAG CACCGCAATA T 31

(16) INFORMATION FOR SEQ ID NO:15:

- 15 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 1002 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

20 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:15:

ATGCAGGCCG CTGGGCACCC AGAGCCCCTT GACAGCAGGG GCTCCTTCTC CCTCCCCACG 60
 ATGGGTGCCA ACGTCTCTCA GGACAATGGC ACTGGCCACA ATGCCACCTT CTCGAGGCCA 120
 CTGCCGTTCC TCTATGTGCT CTGCCCCGCC GTGTACTCCG GGATCTGTGC TGTGGGGCTG 180
 ACTGSCAACA CGGCCGTCAT CTTTGTATC CTAAGGGCGC CCAAGATGAA GACGGTGACC 240
 25 AACGTGTTC AACTGAACCT GGCCGTGCGC GACGGGCTCT TCACGCTGGT ACTGCCCCGT 300
 AACATCGCG AGCACCTGCT GCAGTACTGG CCTTCGGGG AGCTGCTCTG CAAGCTGGTG 360
 CTGGCCGTCG ACCACTACAA CATCTTCTCC AGCATCTACT TCCTAGCCGT GATGAGCGTG 420
 GACCGATACC TGGTGTGCTG GGCCACCGTG AGGTCCCCGC ACATGCCCTG GCGCACCTAC 480
 CGGGGGCGA AGGTGCCAG CCTGTGTGTC TGGCTGGGCG TCACGGTCCT GGTCTGTCCC 540
 30 TTCTTCTCTT TCGCTGGCGT CTACAGCAAC GAGCTGCAGG TCCAAGCTG TGGGCTGAGC 600
 TTCCCGTGGC CCGAGCGGTG CTGGTTCAAG GCCAGCCGTG TCTACACTTT GGTCTGTGGC 660
 TTCGTGCTGC CCGTGTGCAC CATCTGTGTG CTCTACACAG ACCTCCTGCG CAGGCTGCGG 720

GCCGTGCGGC TCCGCTCTGG AGCCAAGGCT CTAGGCAAGG CCAGGCGGAA GGTGACCGTC 780
 CTGGTCCTCG TCGTGCTGGC CGTGTGCCTC CTCGTCTGGA CGCCCTTCCA CCTGGCCTCT 840
 GTCGTGGCCC TGACCACGGA CCGTCCCCAG ACCCCACTGG TCATCAGTAT GTCCTACGTC 900
 ATCACCAGCC TCACGTACGC CAACTCGTGC CTGAACCCCT TCCTCTACGC CTTTCTAGAT 960
 5 GACAACCTCC GGAAGAAGCT CCGCAGCATA TTGCGGTGCT GA 1002

(17) INFORMATION FOR SEQ ID NO:16:

(i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 333 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:16:

15 Met Gln Ala Ala Gly His Pro Glu Pro Leu Asp Ser Arg Gly Ser Phe
 1 5 10 15
 Ser Leu Pro Thr Met Gly Ala Asn Val Ser Gln Asp Asn Gly Thr Gly
 20 25 30
 His Asn Ala Thr Phe Ser Glu Pro Leu Pro Phe Leu Tyr Val Leu Leu
 35 40 45
 20 Pro Ala Val Tyr Ser Gly Ile Cys Ala Val Gly Leu Thr Gly Asn Thr
 50 55 60
 Ala Val Ile Leu Val Ile Leu Arg Ala Pro Lys Met Lys Thr Val Thr
 65 70 75 80
 25 Asn Val Phe Ile Leu Asn Leu Ala Val Ala Asp Gly Leu Phe Thr Leu
 85 90 95
 Val Leu Pro Val Asn Ile Ala Glu His Leu Leu Gln Tyr Trp Pro Phe
 100 105 110
 Gly Glu Leu Leu Cys Lys Leu Val Leu Ala Val Asp His Tyr Asn Ile
 115 120 125
 30 Phe Ser Ser Ile Tyr Phe Leu Ala Val Met Ser Val Asp Arg Tyr Leu
 130 135 140
 Val Val Leu Ala Thr Val Arg Ser Arg His Met Pro Trp Arg Thr Tyr
 145 150 155 160
 35 Arg Gly Ala Lys Val Ala Ser Leu Cys Val Trp Leu Gly Val Thr Val
 165 170 175

14

Leu Val Leu Pro Phe Phe Ser Phe Ala Gly Val Tyr Ser Asn Glu Leu
 180 185 190
 Gln Val Pro Ser Cys Gly Leu Ser Phe Pro Trp Pro Glu Arg Val Trp
 195 200 205
 5 Phe Lys Ala Ser Arg Val Tyr Thr Leu Val Leu Gly Phe Val Leu Pro
 210 215 220
 Val Cys Thr Ile Cys Val Leu Tyr Thr Asp Leu Leu Arg Arg Leu Arg
 225 230 235 240
 10 Ala Val Arg Leu Arg Ser Gly Ala Lys Ala Leu Gly Lys Ala Arg Arg
 245 250 255
 Lys Val Thr Val Leu Val Leu Val Val Leu Ala Val Cys Leu Leu Cys
 260 265 270
 Trp Thr Pro Phe His Leu Ala Ser Val Val Ala Leu Thr Thr Asp Leu
 275 280 285
 15 Pro Gln Thr Pro Leu Val Ile Ser Met Ser Tyr Val Ile Thr Ser Leu
 290 295 300
 Thr Tyr Ala Asn Ser Cys Leu Asn Pro Phe Leu Tyr Ala Phe Leu Asp
 305 310 315 320
 20 Asp Asn Phe Arg Lys Asn Phe Arg Ser Ile Leu Arg Cys
 325 330

(18) INFORMATION FOR SEQ ID NO:17:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 48 base pairs
 (B) TYPE: nucleic acid
 25 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
 (ii) MOLECULE TYPE: DNA (genomic)
 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:17:

ACGAATTCAG CCATGGTCCT TGAGGTGAGT GACCACCAAG TGCTAAAT

48

30 (19) INFORMATION FOR SEQ ID NO:18:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 27 base pairs
 (B) TYPE: nucleic acid
 35 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
 (ii) MOLECULE TYPE: DNA (genomic)
 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:18:

GAGGATCCTG GAATGCGGGG AAGTCAG

27

(20) INFORMATION FOR SEQ ID NO:19:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 1107 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:19:

10 ATGGTCCCTG AGGTGAGTGA CCACCAAGTG CTAATGACG CCGAGGTTGC CGCCCTCCTG 60
 GAGAACTTCA GCTCTTCTTA TGACTATGGA GAAAACGAGA GTGACTCGTG CTGTACCTCC 120
 CCGCCCTGCC CACAGGACTT CAGCCTGAAC TTCGACCGGG CCTTCCTGCC AGCCCTCTAC 180
 AGCCTCCTCT TTCTGCTGGG GCTGCTGGGC AACGGCGCGG TGGCAGCCGT GCTGCTGAGC 240
 CGCGGACAG CCCTGAGCAG CACCGACACC TTCCTGCTCC ACCTAGCTGT AGCAGACACG 300
 15 CTGCTGGTGC TGACACTGCC GCTCTGGGCA GTGGACGCTG CCGTCCAGTG GGTCTTTGGC 360
 TCTGGCCTCT GCAAAGTGGC AGGTGCCCTC TTCAACATCA ACTTCTACGC AGGAGCCCTC 420
 CTGCTGGCCT GCATCAGCTT TGACCGCTAC CTGAACATAG TTCATGCCAC CCAGCTCTAC 480
 CGCGGGGGGC CCGCGGCCG CGTGACCTC ACCTGCCTGG CTGCTGSGG GCTCTGCCTG 540
 CTTTTGCCCC TCCAGACTT CATCTTCCTG TCGGCCACG ACGAGGAGCG CCTCAACGCC 600
 20 ACCCACTGCC AATACAACTT CCCACAGTG GCGCGCACGG CTCTGCGGGT GCTGCACTG 660
 GTGGCTGGCT TTCTGTGCC CCGTGTGGTC ATGGCCTACT GCTATGCCCA CATCCTGGCC 720
 GTGCTGTGCG TTTCAGGGG CCAGCGGCGC CTGCGGGCCA TCGCGCTGGT GGTGGTGGTC 780
 GTGGTGGCCT TTGCCCCTCG CTGGACCCCC TATCACTGG TGGTGTGGT GGACATCCTC 840
 ATGGACCTGG GCGCTTTGGC CCGCAACTGT GCGCGAGAAA GCAGGGTAGA CGTGGCCAAG 900
 25 TCGGTCACTT CAGGCTGGG CTACATGCAC TGCTGCCTCA ACCCGCTGCT CTATGCCTTT 960
 GTAGGGGTCA AGTTCGGGGA GCGGATGTGG ATGCTGCTCT TCGCCTGGG CTGCCCCAAC 1020
 CAGAGAGGGC TCCAGAGGCA GCCATCGTCT TCCGCGCGG ATTCATCCTG GTCTGAGACC 1080
 TCAGAGGCCT CCTACTCGGG CTTGTGA 1107

(21) INFORMATION FOR SEQ ID NO:20:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 368 amino acids

(B) TYPE: amino acid

(C) STRANDEDNESS:

(D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:20:

Met Val Leu Glu Val Ser Asp His Gln Val Leu Asn Asp Ala Glu Val
 1 5 10 15

Ala Ala Leu Leu Glu Asn Phe Ser Ser Ser Tyr Asp Tyr Gly Glu Asn
 20 25 30

Glu Ser Asp Ser Cys Cys Thr Ser Pro Pro Cys Pro Gln Asp Phe Ser
 35 40 45

Leu Asn Phe Asp Arg Ala Phe Leu Pro Ala Leu Tyr Ser Leu Leu Phe
 50 55 60

Leu Leu Gly Leu Leu Gly Asn Gly Ala Val Ala Ala Val Leu Leu Ser
 65 70 75 80

Arg Arg Thr Ala Leu Ser Ser Thr Asp Thr Phe Leu Leu His Leu Ala
 85 90 95

Val Ala Asp Thr Leu Leu Val Leu Thr Leu Pro Leu Trp Ala Val Asp
 100 105 110

Ala Ala Val Gln Trp Val Phe Gly Ser Gly Leu Cys Lys Val Ala Gly
 115 120 125

Ala Leu Phe Asn Ile Asn Phe Tyr Ala Gly Ala Leu Leu Leu Ala Cys
 130 135 140

Ile Ser Phe Asp Arg Tyr Leu Asn Ile Val His Ala Thr Gln Leu Tyr
 145 150 155 160

Arg Arg Gly Pro Pro Ala Arg Val Thr Leu Thr Cys Leu Ala Val Trp
 165 170 175

Gly Leu Cys Leu Leu Phe Ala Leu Pro Asp Phe Ile Phe Leu Ser Ala
 180 185 190

His His Asp Glu Arg Leu Asn Ala Thr His Cys Gln Tyr Asn Phe Pro
 195 200 205

Gln Val Gly Arg Thr Ala Leu Arg Val Leu Gln Leu Val Ala Gly Phe
 210 215 220

Leu Leu Pro Leu Leu Val Met Ala Tyr Cys Tyr Ala His Ile Leu Ala
 225 230 235 240

17

Val Leu Leu Val Ser Arg Gly Gln Arg Arg Leu Arg Ala Met Arg Leu
245 250 255

Val Val Val Val Val Val Ala Phe Ala Leu Cys Trp Thr Pro Tyr His
260 265 270

5 Leu Val Val Leu Val Asp Ile Leu Met Asp Leu Gly Ala Leu Ala Arg
275 280 285

Asn Cys Gly Arg Glu Ser Arg Val Asp Val Ala Lys Ser Val Thr Ser
290 295 300

10 Gly Leu Gly Tyr Met His Cys Cys Leu Asn Pro Leu Leu Tyr Ala Phe
305 310 315 320

Val Gly Val Lys Phe Arg Glu Arg Met Trp Met Leu Leu Leu Arg Leu
325 330 335

Gly Cys Pro Asn Gln Arg Gly Leu Gln Arg Gln Pro Ser Ser Ser Arg
340 345 350

15 Arg Asp Ser Ser Trp Ser Glu Thr Ser Glu Ala Ser Tyr Ser Gly Leu
355 360 365

(22) INFORMATION FOR SEQ ID NO:21:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 30 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:21:

25 TTAAGCTTGA CCTAATGCCA TCTGTGTCC 30

(23) INFORMATION FOR SEQ ID NO:22:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 30 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:22:

TTGGATCCAA AAGAACCATG CACCTCAGAG 30

35 (24) INFORMATION FOR SEQ ID NO:23:

- (i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 1074 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

5 (ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:23:

	ATGGCTGATG ACTATGGCTC TGAATCCACA TCTTCCATGG AAGACTACGT TAACCTCAAC	60
	TTCACTGACT TCTACTGTGA GAAAAACAAT GTCAGGCAGT TTGCGAGCCA TTCTCTCCCA	120
	CCCTTGTA CT GGCTCGTGTT CATCGTGGGT GCCTTGGGCA ACAGTCTTGT TATCCTTGTC	180
10	TACTGGTACT GCACAAGAGT GAAGACCATG ACCGACATGT TCCTTTTGAA TTTGGCAATT	240
	GCTGACCTCC TCTTTCTTGT CACTCTTCCC TTCTGGGCCA TTGCTGCTGC TGACCACTGG	300
	AAGTTCAGA CCTTCATGTG CAAGGTGGTC AACAGCATGT ACAAGATGAA CTTCTACAGC	360
	TGTGTGTTGC TGATCATGTG CATCAGCGTG GACAGGTACA TTGCCATTGC CCAGGCCATG	420
	AGAGCACATA CTTGGAGGGA GAAAAGGCTT TTGTACAGCA AAATGGTTTG CTTTACCATC	480
15	TGGGTATTGG CAGTGCTCT CTGCATCCCA GAAATCTTAT ACAGCCAAAT CAAGGAGGAA	540
	TCCGGCATTG CTATCTGCAC CATGGTTTAC CCTAGCGATG AGAGCACCAA ACTGAAGTCA	600
	GCTGTCTTGA CCCTGAAGGT CATTCTGGGG TTCTTCTTTC CCTTCGTGGT CATGGCTTGC	660
	TGCTATACCA TCATCATTCA CACCCTGATA CAAGCCAAGA AGTCTTCCAA GCACAAAGCC	720
	CTAAAAGTGA CCATCACTGT CTTGACCGTC TTTGTCTTGT CTCAGTTTCC CTACAACTGC	780
20	ATTTTGTGTG TGACAGCCAT TGACGCCTAT GCCATGTTCA TCTCCAATG TGCGGTTTCC	840
	ACCAACATTG ACATCTGCTT CCAGGTCACC CAGACCATCG CCTTCTTCCA CAGTTGCCTG	900
	AACCCTGTTT TCTATGTTTT TGTGGGTGAG AGATTCCGCC GGGATCTCGT GAAAACCTG	960
	AAGAAGTTGG GTTGATCAG CCAGGCCCGG TGGGTTTCAT TTACAAGGAG AGAGGGAAGC	1020
	TTGAAGCTGT CGTCTATGTT GCTGGAGACA ACCTCAGGAG CACTCTCCCT CTGA	1074

25 (25) INFORMATION FOR SEQ ID NO:24:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 357 amino acids
 - (B) TYPE: amino acid
 - (C) STRANDEDNESS:
 - (D) TOPOLOGY: not relevant

30

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:24:

	Met	Ala	Asp	Asp	Tyr	Gly	Ser	Glu	Ser	Thr	Ser	Ser	Met	Glu	Asp	Tyr	
	1				5					10				15			
5	Val	Asn	Phe	Asn	Phe	Thr	Asp	Phe	Tyr	Cys	Glu	Lys	Asn	Asn	Val	Arg	
				20					25				30				
	Gln	Phe	Ala	Ser	His	Phe	Leu	Pro	Pro	Leu	Tyr	Trp	Leu	Val	Phe	Ile	
			35				40						45				
	Val	Gly	Ala	Leu	Gly	Asn	Ser	Leu	Val	Ile	Leu	Val	Tyr	Trp	Tyr	Cys	
		50				55					60						
10	Thr	Arg	Val	Lys	Thr	Met	Thr	Asp	Met	Phe	Leu	Leu	Asn	Leu	Ala	Ile	
	65				70					75					80		
	Ala	Asp	Leu	Leu	Phe	Leu	Val	Thr	Leu	Pro	Phe	Trp	Ala	Ile	Ala	Ala	
					85				90					95			
15	Ala	Asp	Gln	Trp	Lys	Phe	Gln	Thr	Phe	Met	Cys	Lys	Val	Val	Asn	Ser	
			100						105					110			
	Met	Tyr	Lys	Met	Asn	Phe	Tyr	Ser	Cys	Val	Leu	Leu	Ile	Met	Cys	Ile	
		115					120					125					
	Ser	Val	Asp	Arg	Tyr	Ile	Ala	Ile	Ala	Gln	Ala	Met	Arg	Ala	His	Thr	
		130				135						140					
20	Trp	Arg	Glu	Lys	Arg	Leu	Leu	Tyr	Ser	Lys	Met	Val	Cys	Phe	Thr	Ile	
	145				150					155					160		
	Trp	Val	Leu	Ala	Ala	Ala	Leu	Cys	Ile	Pro	Glu	Ile	Leu	Tyr	Ser	Gln	
				165					170					175			
25	Ile	Lys	Glu	Glu	Ser	Gly	Ile	Ala	Ile	Cys	Thr	Met	Val	Tyr	Pro	Ser	
		180						185					190				
	Asp	Glu	Ser	Thr	Lys	Leu	Lys	Ser	Ala	Val	Leu	Thr	Leu	Lys	Val	Ile	
		195					200						205				
	Leu	Gly	Phe	Phe	Leu	Pro	Phe	Val	Val	Met	Ala	Cys	Cys	Tyr	Thr	Ile	
		210				215					220						
30	Ile	Ile	His	Thr	Leu	Ile	Gln	Ala	Lys	Lys	Ser	Ser	Lys	His	Lys	Ala	
	225				230				235						240		
	Leu	Lys	Val	Thr	Ile	Thr	Val	Leu	Thr	Val	Phe	Val	Leu	Ser	Gln	Phe	
				245				250						255			
35	Pro	Tyr	Asn	Cys	Ile	Leu	Leu	Val	Gln	Thr	Ile	Asp	Ala	Tyr	Ala	Met	
			260					265					270				
	Phe	Ile	Ser	Asn	Cys	Ala	Val	Ser	Thr	Asn	Ile	Asp	Ile	Cys	Phe	Gln	
		275						280					285				

Val Thr Gln Thr Ile Ala Phe Phe His Ser Cys Leu Asn Pro Val Leu
 290 295 300
 Tyr Val Phe Val Gly Glu Arg Phe Arg Arg Asp Leu Val Lys Thr Leu
 305 310 315 320
 5 Lys Asn Leu Gly Cys Ile Ser Gln Ala Gln Trp Val Ser Phe Thr Arg
 325 330 335
 Arg Glu Gly Ser Leu Lys Leu Ser Ser Met Leu Leu Glu Thr Thr Ser
 340 345 350
 10 Gly Ala Leu Ser Leu
 355
 (26) INFORMATION FOR SEQ ID NO:25:
 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 1110 base pairs
 (B) TYPE: nucleic acid
 15 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
 (ii) MOLECULE TYPE: DNA (genomic)
 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:25:
 ATGGCCTCAT CGACCACTCG GGGCCCCAGG GTTTCGACT TATTTTCGCG GCTGCCCGCG 60
 20 GCGGTCACAA CTCCTCGCAA CCAGAGCGCA GAGGCCTCGG CGGGCAACGG GTCGGTGGCT 120
 GCGCGGACG CTCACGCGT CACGCCCTTC CAGAGCCTGC AGCTGGTGCA TCAGCTGAAG 180
 GGGCTGATCG TGCTGCTCTA CAGCGTCGTG GTGGTCGTGG GGCTGGTGGG CAACTGCCTG 240
 CTGGTGCTGG TGATCGCGCG GGTGCCCGGG CTGCACAACG TGACGAACCT CCTCATCGCG 300
 AACCTGGCCT TGTCGACGCT GCTCATGTGC ACCGCCTGCG TGCCGCTCAC GCTGGCCTAT 360
 25 GCCTTCGAGC CACGCGGCTG GGTGTTCCGG GCGGCGCTGT GCCACCTGAT CTTCTTCTCT 420
 CAGCCGGTCA CCGTCTATGT GTCGGTGTC ACGCTCACCA CCATCGCAGT GGACCGCTAC 480
 GTCGTGCTGG TGACCCGCGT GAGGCGCGCA TCTCGCTGCG CCTCAGCCTA CGCTGTGCTG 540
 GCCATCTGGG CGCTGTCCGC GTGTCTGGCG CTGCGCGCCG CCGTGACAC ATATACGCTG 600
 GAGCTCAAGC CGCACGACGT GCGCCTCTGC GAGGAGTTCT GGGGTCCCA GGAGCGCCAG 660
 30 CGCCAGCTCT ACGCCTGGGG GCTGTGCTG GTCACCTACC TGCTCCCTCT GCTGGTCATC 720
 CTCCTGTCTT ACGTCCGGGT GTCAGTGAAG CTCGCAACC CGGTGGTGCC GGGGTGCGTG 780
 ACCCAGAGCC AGGCGGACTG GGACCGCGCT CGGCGCCGCG GCACCTTCTG CTTGCTGGTG 840

GTGGTCGTGG TGGTGTTCGC CGTCTGCTGG CTGCCGCTGC ACGTCTTCAA CCTGCTGCGG 900
 GACCTCGACC CCCACGCCAT CGACCCTTAC GCCTTTGGGC TGGTGCAGCT GCTCTGCCAC 960
 TGGCTCGCCA TGAGTTGCGC CTGCTACAAC CCCTTCATCT ACCCTGCGCT GCACGACAGC 1020
 TTCCGCGAGG AGCTCGCGAA ACTGTTGGTC GCTTGGCCCC GCAAGATAGC CCCCATGGC 1080
 5 CAGAATATGA CCGTCAGCGT GGTCTCTGA 1110

(27) INFORMATION FOR SEQ ID NO:26:

(i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 369 amino acids
 (B) TYPE: amino acid
 10 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:26:

15 Met Ala Ser Ser Thr Thr Arg Gly Pro Arg Val Ser Asp Leu Phe Ser
 1 5 10 15
 Gly Leu Pro Pro Ala Val Thr Thr Pro Ala Asn Gln Ser Ala Glu Ala
 20 25 30
 Ser Ala Gly Asn Gly Ser Val Ala Gly Ala Asp Ala Pro Ala Val Thr
 35 40 45
 20 Pro Phe Gln Ser Leu Gln Leu Val His Gln Leu Lys Gly Leu Ile Val
 50 55 60
 Leu Leu Tyr Ser Val Val Val Val Val Gly Leu Val Gly Asn Cys Leu
 65 70 75 80
 25 Leu Val Leu Val Ile Ala Arg Val Pro Arg Leu His Asn Val Thr Asn
 85 90 95
 Phe Leu Ile Gly Asn Leu Ala Leu Ser Asp Val Leu Met Cys Thr Ala
 100 105 110
 Cys Val Pro Leu Thr Leu Ala Tyr Ala Phe Glu Pro Arg Gly Trp Val
 115 120 125
 30 Phe Gly Gly Gly Leu Cys His Leu Val Phe Phe Leu Gln Pro Val Thr
 130 135 140
 Val Tyr Val Ser Val Phe Thr Leu Thr Thr Ile Ala Val Asp Arg Tyr
 145 150 155 160
 35 Val Val Leu Val His Pro Leu Arg Arg Ala Ser Arg Cys Ala Ser Ala
 165 170 175

22

Tyr Ala Val Leu Ala Ile Trp Ala Leu Ser Ala Val Leu Ala Leu Pro
 180 185 190
 Pro Ala Val His Thr Tyr His Val Glu Leu Lys Pro His Asp Val Arg
 195 200 205
 5 Leu Cys Glu Glu Phe Trp Gly Ser Gln Glu Arg Gln Arg Gln Leu Tyr
 210 215 220
 Ala Trp Gly Leu Leu Leu Val Thr Tyr Leu Leu Pro Leu Leu Val Ile
 225 230 235 240
 10 Leu Leu Ser Tyr Val Arg Val Ser Val Lys Leu Arg Asn Arg Val Val
 245 250 255
 Pro Gly Cys Val Thr Gln Ser Gln Ala Asp Trp Asp Arg Ala Arg Arg
 260 265 270
 Arg Arg Thr Phe Cys Leu Leu Val Val Val Val Val Phe Ala Val
 275 280 285
 15 Cys Trp Leu Pro Leu His Val Phe Asn Leu Leu Arg Asp Leu Asp Pro
 290 295 300
 His Ala Ile Asp Pro Tyr Ala Phe Gly Leu Val Gln Leu Leu Cys His
 305 310 315 320
 20 Trp Leu Ala Met Ser Ser Ala Cys Tyr Asn Pro Phe Ile Tyr Ala Trp
 325 330 335
 Leu His Asp Ser Phe Arg Glu Glu Leu Arg Lys Leu Leu Val Ala Trp
 340 345 350
 Pro Arg Lys Ile Ala Pro His Gly Gln Asn Met Thr Val Ser Val Val
 355 360 365
 25 Ile

(28) INFORMATION FOR SEQ ID NO:27:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 1083 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
 (ii) MOLECULE TYPE: DNA (genomic)
 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:27:
 35 ATGGACCCAG AAGAACTTC AGTTTATTG GATTATTACT ATGCTACGAG CCCAACTCT 60
 GACATCAGGG AGACCACTC CCATGTTCTT TACACCTCTG TCTTCTTCC AGTCTTTTAC 120

ACAGCTGTGT TCCTGACTGG AGTGCTGGGG AACCTTGITC TCATGGGAGC GTTGCAATTTC 180
 AAACCCGGCA GCCGAAGACT GATCGACATC TTTATCATCA ATCTGGCTGC CTCTGACTTC 240
 ATTTTCTTGT TCACATTGCC TCTCTGGGTG GATAAAGAAG CATCTCTAGG ACTGTGGAGG 300
 ACGGGCTCCT TCCTGTGCAA AGGGAGCTCC TACATGATCT CCGTCAATAT GCAGTGCAGT 360
 5 GTCTCTCTGC TCACTTGCAT GAGTGTGAC CGCTACCTGG CCATTGTGTG GCCAGTCGTA 420
 TCCAGGAAT TCAGAAGGAC AGACTGTGCA TATGTAGTCT GTGCCAGCAT CTGGTTTATC 480
 TCCTGCTGC TGGGGTTGCC TACTCTTCTG TCCAGGGAGC TCACGCTGAT TGATGATAAG 540
 CCATACTGTG CAGAGAAAA GGCAACTCCA ATTAACTCA TATGGTCCCT GGTGGCCCTTA 600
 ATTTTACCT TTTTGTCCC TTTGTTGAGC ATTGTGACCT GCTACTGTG CATTGCAAGG 660
 10 AAGCTGTGTG CCCATTACCA GCAATCAGGA AAGCACACA AAAAGCTGAA GAAATCTATA 720
 AAGATCATCT TTATTGTCGT GGCAGCCTTT CTGTCTCCT GGCTGCCCTT CAATACTTTC 780
 AAGTCTCTGG CCATTGTCTC TGGGTTGCGG CAAGAACACT ATTTACCCTC AGCTATTCTT 840
 CAGCTTGGTA TGGAGGTGAG TGGACCTTGT GCATTTGCCA ACAGCTGTGT CAACCCCTTC 900
 ATTTACTATA TCTTCGACAG CTACATCCGC CGGGCCATTG TCCACTGCTT GTGCCCTTGC 960
 15 CTGAAAAACT ATGACTTTGG GAGTAGCACT GAGACATCAG ATAGTACCT CACTAAGGCT 1020
 CTCTCCACCT TCATTATGC AGAAGATTTT GCCAGGAGGA GGAAGAGGTC TGITGCACTC 1080
 TAA 1083

(29) INFORMATION FOR SEQ ID NO:28:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 360 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:28:

Met Asp Pro Glu Glu Thr Ser Val Tyr Leu Asp Tyr Tyr Tyr Ala Thr
 1 5 10 15
 Ser Pro Asn Ser Asp Ile Arg Glu Thr His Ser His Val Pro Tyr Thr
 20 25 30
 30 Ser Val Phe Leu Pro Val Phe Tyr Thr Ala Val Phe Leu Thr Gly Val
 35 40 45

24

Leu Gly Asn Leu Val Leu Met Gly Ala Leu His Phe Lys Pro Gly Ser
 50 55 60

Arg Arg Leu Ile Asp Ile Phe Ile Ile Asn Leu Ala Ala Ser Asp Phe
 65 70 75 80

5 Ile Phe Leu Val Thr Leu Pro Leu Trp Val Asp Lys Glu Ala Ser Leu
 85 90 95

Gly Leu Trp Arg Thr Gly Ser Phe Leu Cys Lys Gly Ser Ser Tyr Met
 100 105 110

10 Ile Ser Val Asn Met His Cys Ser Val Leu Leu Leu Thr Cys Met Ser
 115 120 125

Val Asp Arg Tyr Leu Ala Ile Val Trp Pro Val Val Ser Arg Lys Phe
 130 135 140

Arg Arg Thr Asp Cys Ala Tyr Val Val Cys Ala Ser Ile Trp Phe Ile
 145 150 155 160

15 Ser Cys Leu Leu Gly Leu Pro Thr Leu Leu Ser Arg Glu Leu Thr Leu
 165 170 175

Ile Asp Asp Lys Pro Tyr Cys Ala Glu Lys Lys Ala Thr Pro Ile Lys
 180 185 190

20 Leu Ile Trp Ser Leu Val Ala Leu Ile Phe Thr Phe Phe Val Pro Leu
 195 200 205

Leu Ser Ile Val Thr Cys Tyr Cys Cys Ile Ala Arg Lys Leu Cys Ala
 210 215 220

His Tyr Gln Gln Ser Gly Lys His Asn Lys Lys Leu Lys Lys Ser Ile
 225 230 235 240

25 Lys Ile Ile Phe Ile Val Val Ala Ala Phe Leu Val Ser Trp Leu Pro
 245 250 255

Phe Asn Thr Phe Lys Phe Leu Ala Ile Val Ser Gly Leu Arg Gln Glu
 260 265 270

30 His Tyr Leu Pro Ser Ala Ile Leu Gln Leu Gly Met Glu Val Ser Gly
 275 280 285

Pro Leu Ala Phe Ala Asn Ser Cys Val Asn Pro Phe Ile Tyr Tyr Ile
 290 295 300

Phe Asp Ser Tyr Ile Arg Arg Ala Ile Val His Cys Leu Cys Pro Cys
 305 310 315 320

35 Leu Lys Asn Tyr Asp Phe Gly Ser Ser Thr Glu Thr Ser Asp Ser His
 325 330 335

Leu Thr Lys Ala Leu Ser Thr Phe Ile His Ala Glu Asp Phe Ala Arg

340

345

350

Arg Arg Lys Arg Ser Val Ser Leu
355 360

(30) INFORMATION FOR SEQ ID NO:29:

- 5 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 31 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear
- 10 (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:29:

CTAGAATTCT GACTCCAGCC AAAGCATGAA T

31

(31) INFORMATION FOR SEQ ID NO:30:

- 15 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 30 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- 20 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:30:

GCTGGATCCT AAACAGTCTG CGCTCGGCCT

30

(32) INFORMATION FOR SEQ ID NO:31:

- 25 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 1020 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:31:

30 ATGAATGGCC TTGAAGTGGC TCCCCCAGGT CTGATCACCA ACTTCTCCCT GGCCACGGCA 60

GAGCAATGTG GCCAGGAGAC GCCACTGGAG AACATGCTGT TCGCCTCCTT CTACCTTCTG 120

GATTTTATCC TGGCTTTAGT TGGCAATACC CTGGCTCTGT GGCCTTTTCAT CCGAGACCAC 180

AAGTCGGGA CCCCAGGCAA CGTGTTCCTG ATGCATCTGG CCGTGGCCGA CTTGTGCTGC 240

GTGCTGGTCC TGCCACCCG CCTGGTCTAC CACTTCTCTG GGAACCACTG GCCATTGGG 300

GAAATCGCAT GCCGTCTCAC CGGCTTCCTC TTCTACCTCA ACATGTACGC CAGCATCTAC 360
 TTCCTCACCT GCATCAGCGC CGACCGTTTC CTGGCCATTG TGCACCCGGT CAAGTCCCTC 420
 AAGCTCCGCA GGCCCTCTA CGCACACCTG GCCTGTGCCT TCCTGTGGGT GGTGGTGGCT 480
 GTGGCCATTG CCCCGCTGCT GGTGAGCCCA CAGACCGTGC AGACCAACCA CACGGTGGTC 540
 5 TGCCTGCAGC TGTACCGGGA GAAGGCCTCC CACCATGCCC TGGTGTCCCT GGCAGTGGCC 600
 TTCACCTTCC CGTTTCATC CACGGTCACC TGCTACCTGC TGATCATCCG CAGCCTGCGG 660
 CAGGGCCTGC GTGTGGAGAA GCGCCTCAAG ACCAAGGCAG TGCGCATGAT CGCCATAGTG 720
 CTGGCCATCT TCCTGGTCTG CTTCTGCCCC TACCACGTCA ACCGCTCCGT CTACGTGCTG 780
 CACTACCGCA GCCATGGGGC CTCCTGCGCC ACCCAGCGCA TCCTGGCCCT GGCAAACCGC 840
 10 ATCACCTCCT GCCTCACCAG CCTCAACGGG GCACTCGACC CCATCATGTA TTTCTTCGTG 900
 GCTGAGAAGT TCCGCCACGC CCTGTGCAAC TTGCTCTGTG GCAAAGGCT CAAGGGCCCG 960
 CCCCCAGCT TCGAAGGGAA AACCAACGAG AGCTCGCTGA GTGCCAAGTC AGAGCTGTGA 1020

(33) INFORMATION FOR SEQ ID NO:32:

- (i) SEQUENCE CHARACTERISTICS:
 15 (A) LENGTH: 339 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

- 20 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:32:

Met Asn Gly Leu Glu Val Ala Pro Pro Gly Leu Ile Thr Asn Phe Ser
 1 5 10 15
 Leu Ala Thr Ala Glu Gln Cys Gly Gln Glu Thr Pro Leu Glu Asn Met
 20 25 30
 25 Leu Phe Ala Ser Phe Tyr Leu Leu Asp Phe Ile Leu Ala Leu Val Gly
 35 40 45
 Asn Thr Leu Ala Leu Trp Leu Phe Ile Arg Asp His Lys Ser Gly Thr
 50 55 60
 30 Pro Ala Asn Val Phe Leu Met His Leu Ala Val Ala Asp Leu Ser Cys
 65 70 75 80
 Val Leu Val Leu Pro Thr Arg Leu Val Tyr His Phe Ser Gly Asn His
 85 90 95
 Trp Pro Phe Gly Glu Ile Ala Cys Arg Leu Thr Gly Phe Leu Phe Tyr

27

	100	105	110
	Leu Asn Met Tyr Ala Ser Ile Tyr Phe Leu Thr Cys Ile Ser Ala Asp 115	120	125
5	Arg Phe Leu Ala Ile Val His Pro Val Lys Ser Leu Lys Leu Arg Arg 130	135	140
	Pro Leu Tyr Ala His Leu Ala Cys Ala Phe Leu Trp Val Val Val Ala 145	150	160
	Val Ala Met Ala Pro Leu Leu Val Ser Pro Gln Thr Val Gln Thr Asn 165	170	175
10	His Thr Val Val Cys Leu Gln Leu Tyr Arg Glu Lys Ala Ser His His 180	185	190
	Ala Leu Val Ser Leu Ala Val Ala Phe Thr Phe Pro Phe Ile Thr Thr 195	200	205
15	Val Thr Cys Tyr Leu Leu Ile Ile Arg Ser Leu Arg Gln Gly Leu Arg 210	215	220
	Val Glu Lys Arg Leu Lys Thr Lys Ala Val Arg Met Ile Ala Ile Val 225	230	240
	Leu Ala Ile Phe Leu Val Cys Phe Val Pro Tyr His Val Asn Arg Ser 245	250	255
20	Val Tyr Val Leu His Tyr Arg Ser His Gly Ala Ser Cys Ala Thr Gln 260	265	270
	Arg Ile Leu Ala Leu Ala Asn Arg Ile Thr Ser Cys Leu Thr Ser Leu 275	280	285
25	Asn Gly Ala Leu Asp Pro Ile Met Tyr Phe Phe Val Ala Glu Lys Phe 290	295	300
	Arg His Ala Leu Cys Asn Leu Leu Cys Gly Lys Arg Leu Lys Gly Pro 305	310	320
	Pro Pro Ser Phe Glu Gly Lys Thr Asn Glu Ser Ser Leu Ser Ala Lys 325	330	335
30	Ser Glu Leu		

(34) INFORMATION FOR SEQ ID NO:33:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 29 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: single
 - (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:33:

ATAAGATGAT CACCCTGAAC AATCAAGAT

29

(35) INFORMATION FOR SEQ ID NO:34:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 33 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:34:

TCCGAATTCA TAACATTTCA CTGTTTATAT TGC

33

(36) INFORMATION FOR SEQ ID NO:35:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 996 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:35:

20	ATGATCACCC TGAACAATCA AGATCAACCT GTCAC TTTTA ACAGCTCACA TCCAGATGAA	60
	TACAAAATTG CAGCCCTTGT CTTCTATAGC TGTATCTTCA TAATTGGATT ATTTGTTAAC	120
	ATCACTGCAT TATGGGTTTT CAGTTGTACC ACCAAGAAGA GAACCCGGT AACCATCTAT	180
	ATGATGAATG TGGCATTAGT GGA CTTGATA TTTATAATGA CTTTACCCTT TCGAATGTTT	240
	TATTATGCAA AAGATGCATG GCCATTTGGA GAGTACTTCT GCCAGATTAT TGGAGCTCTC	300
25	ACAGTGT TTT ACCCAAGCAT TGCTTTATGG CTCTCTGCCT TTATTAGTGC TGACAGATAC	360
	ATGGCCATTG TACAGCCGAA GTACGCCAAA GAAC TTA AAA ACACGTGCAA AGCCGTGCTG	420
	GCGTGTGTGG GAGTCTGGAT AATGACCCTG ACCACGACCA CCCCTCTGCT ACTGCTCTAT	480
	AAAGACCCAG ATAAAGACTC CACTCCCCGC ACCTGCCTCA AGATTTC TGA CATCATCTAT	540
	CTAAAAGCTG TGAACGTGCT GAACCTCACT CGACTGACAT TTTT TTTCTT GATTCTCTTG	600
30	TTTCATCATGA TTGGGTGCTA CTTGGTCATT ATTCATAATC TCCTTCACGG CAGGACGTCT	660
	AAGCTGAAAC CCAAAGTCAA GGAGAAGTCC ATAAGGATCA TCATCACGCT GCTGGTGCAG	720

GTGCTCGTCT GCITTTATGCC CTTCCACATC TGTTTCGCTT TCCTGATGCT GGGAAACGGGG 780
 GAGAACAGTT ACAATCCCTG GGGAGCCTTT ACCACCTTCC TCATGAACCT CAGCACGTGT 840
 CTGGAGTGTA TTCTCTACTA CATCGTTTCA AAACAATTTC AGGCTCGAGT CATTAGTGTC 900
 ATGCTATACC GTAATTACCT TCGAAGCCTG CGCAGAAAAA GTTTCGGATC TGGTAGTCTA 960
 5 AGGTCACATA GCAATATAAA CAGTGAAATG TTATGA 996

(37) INFORMATION FOR SEQ ID NO:36:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 331 amino acids

(B) TYPE: amino acid

(C) STRANDEDNESS:

(D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:36:

15 Met Ile Thr Leu Asn Asn Gln Asp Gln Pro Val Thr Phe Asn Ser Ser
 1 5 10 15
 His Pro Asp Glu Tyr Lys Ile Ala Ala Leu Val Phe Tyr Ser Cys Ile
 20 25 30
 Phe Ile Ile Gly Leu Phe Val Asn Ile Thr Ala Leu Trp Val Phe Ser
 35 40 45
 20 Cys Thr Thr Lys Lys Arg Thr Thr Val Thr Ile Tyr Met Met Asn Val
 50 55 60
 Ala Leu Val Asp Leu Ile Phe Ile Met Thr Leu Pro Phe Arg Met Phe
 65 70 75 80
 25 Tyr Tyr Ala Lys Asp Ala Trp Pro Phe Gly Glu Tyr Phe Cys Gln Ile
 85 90 95
 Ile Gly Ala Leu Thr Val Phe Tyr Pro Ser Ile Ala Leu Trp Leu Leu
 100 105 110
 Ala Phe Ile Ser Ala Asp Arg Tyr Met Ala Ile Val Gln Pro Lys Tyr
 115 120 125
 30 Ala Lys Glu Leu Lys Asn Thr Cys Lys Ala Val Leu Ala Cys Val Gly
 130 135 140
 Val Trp Ile Met Thr Leu Thr Thr Thr Thr Pro Leu Leu Leu Tyr
 145 150 155 160
 35 Lys Asp Pro Asp Lys Asp Ser Thr Pro Ala Thr Cys Leu Lys Ile Ser
 165 170 175

30

Asp Ile Ile Tyr Leu Lys Ala Val Asn Val Leu Asn Leu Thr Arg Leu
 180 185 190
 Thr Phe Phe Phe Leu Ile Pro Leu Phe Ile Met Ile Gly Cys Tyr Leu
 195 200 205
 5 Val Ile Ile His Asn Leu Leu His Gly Arg Thr Ser Lys Leu Lys Pro
 210 215 220
 Lys Val Lys Glu Lys Ser Ile Arg Ile Ile Ile Thr Leu Leu Val Gln
 225 230 235 240
 10 Val Leu Val Cys Phe Met Pro Phe His Ile Cys Phe Ala Phe Leu Met
 245 250 255
 Leu Gly Thr Gly Glu Asn Ser Tyr Asn Pro Trp Gly Ala Phe Thr Thr
 260 265 270
 Phe Leu Met Asn Leu Ser Thr Cys Leu Asp Val Ile Leu Tyr Tyr Ile
 275 280 285
 15 Val Ser Lys Gln Phe Gln Ala Arg Val Ile Ser Val Met Leu Tyr Arg
 290 295 300
 Asn Tyr Leu Arg Ser Leu Arg Arg Lys Ser Phe Arg Ser Gly Ser Leu
 305 310 315 320
 20 Arg Ser Leu Ser Asn Ile Asn Ser Glu Met Leu
 325 330

(38) INFORMATION FOR SEQ ID NO:37:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 28 base pairs
 (B) TYPE: nucleic acid
 25 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
 (ii) MOLECULE TYPE: DNA (genomic)
 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:37:

CCAAGCTTCC AGGCCTGGGG TGTGCTGG

28

30 (39) INFORMATION FOR SEQ ID NO:38:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 29 base pairs
 (B) TYPE: nucleic acid
 35 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
 (ii) MOLECULE TYPE: DNA (genomic)
 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:38:

ATGGATCCTG ACCTTCGGCC CTTGGCAGA

29

(40) INFORMATION FOR SEQ ID NO:39:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 1077 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:39:

10 ATGCCCTCTG TGTCTCCAGC GGGGCCCTCG GCCGGGGCAG TCCCCAATGC CACCGCAGTG 60
 AACACAGTGC GGACCAATGC CAGCGGGCTG GAGGTGCCCT TGTTCACCT GTTGCCCGG 120
 CTGGACGAGG AGCTGCATGS CACCTTCCCA GGCCTGTGCG TGGCGCTGAT GCGGATGCAC 180
 GGAGCCATCT TCCTGGCAGG GCTGGTGCTC AACGGGCTGG CGCTGTACGT CTCTGTCTGC 240
 CGCACCCGGG CCAAGACACC CTCAGTCATC TACACCATCA ACCTGGTGGT GACCGATCTA 300
 15 CTGGTAGGGC TGTCCCTGCC CACGCGCTTC GCTGTGTAAT ACGGCGCCAG GGGGTGCCCTG 360
 CGCTGTGCCCT TCCGCGCAGT CCTCGGTAC TTCCTCAACA TGCATGCTC CATCCTCTTC 420
 CTCACCTGCA TCTGCGTGGA CCGCTACCTG GCCATCGTGC GGCCCGAAGG CTCGCGCCGC 480
 TGCCGCCAGC CTGCTGTGTC CAGGGCCCTG TGCCTCTTCG TGTGGCTGGC CGCCGGTGGC 540
 GTCACCTGTG CGGTGTGGG CGTGACAGGC AGCCGGCCCT GCTGCCGTGT CTTTGCCTGC 600
 20 ACTGTCTCGG AGTTCCTGCT GCCCTGCTG GTCATCAGCG TGTTTACCGG CCGCATCATG 660
 TGTGCACTGT CGCGGCCGGG TCTGCTCCAC CAGGGTCGCG AGCGCCGCGT CGCGGCCATG 720
 CAGCTCTGTC TCACGGTGCT CATCATCTTT CTCGTCTGCT TCACGCCCTT CCACGCCCGC 780
 CAAGTGGCCG TGGCGCTGTG GCCCGACATG CCACACCACA CGAGCTCGT GGTCTACACC 840
 GTGGCCGTGA CCTCAGCAG CCTCAACAGC TGCATGGACC CCATCGTCTA CTGCTTCGTC 900
 25 ACCAGTGGCT TCCAGGCCAC CGTCCGAGGC CTCTCGGCC AGCAGGAGA GCGTGAGCCC 960
 AGCAGCGGTG ACGTGGTCAG CATGCACAGG AGCTCCAAGG GCTCAGGCCG TCATCACATC 1020
 CTCAGTGCCG GCCCTCACGC CCTCACCAG GCCCTGGCTA ATGGGCCCGA GGCTTAG 1077

(41) INFORMATION FOR SEQ ID NO:40:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 358 amino acids

30

(B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

5 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:40:

```

Met Pro Ser Val Ser Pro Ala Gly Pro Ser Ala Gly Ala Val Pro Asn
1           5           10           15

Ala Thr Ala Val Thr Thr Val Arg Thr Asn Ala Ser Gly Leu Glu Val
                20           25           30

10 Pro Leu Phe His Leu Phe Ala Arg Leu Asp Glu Glu Leu His Gly Thr
    35           40           45

Phe Pro Gly Leu Cys Val Ala Leu Met Ala Val His Gly Ala Ile Phe
    50           55           60

15 Leu Ala Gly Leu Val Leu Asn Gly Leu Ala Leu Tyr Val Phe Cys Cys
    65           70           75           80

Arg Thr Arg Ala Lys Thr Pro Ser Val Ile Tyr Thr Ile Asn Leu Val
    85           90           95

Val Thr Asp Leu Leu Val Gly Leu Ser Leu Pro Thr Arg Phe Ala Val
    100          105          110

20 Tyr Tyr Gly Ala Arg Gly Cys Leu Arg Cys Ala Phe Pro His Val Leu
    115          120          125

Gly Tyr Phe Leu Asn Met His Cys Ser Ile Leu Phe Leu Thr Cys Ile
    130          135          140

25 Cys Val Asp Arg Tyr Leu Ala Ile Val Arg Pro Glu Ala Pro Ala Ala
    145          150          155          160

Cys Arg Gln Pro Ala Cys Ala Arg Ala Val Cys Ala Phe Val Trp Leu
    165          170          175

Ala Ala Gly Ala Val Thr Leu Ser Val Leu Gly Val Thr Gly Ser Arg
    180          185          190

30 Pro Cys Cys Arg Val Phe Ala Leu Thr Val Leu Glu Phe Leu Leu Pro
    195          200          205

Leu Leu Val Ile Ser Val Phe Thr Gly Arg Ile Met Cys Ala Leu Ser
    210          215          220

35 Arg Pro Gly Leu Leu His Gln Gly Arg Gln Arg Arg Val Arg Ala Met
    225          230          235          240

Gln Leu Leu Leu Thr Val Leu Ile Ile Phe Leu Val Cys Phe Thr Pro
    245          250          255

```

33

Phe His Ala Arg Gln Val Ala Val Ala Leu Trp Pro Asp Met Pro His
 260 265 270
 His Thr Ser Leu Val Val Tyr His Val Ala Val Thr Leu Ser Ser Leu
 275 280 285
 5 Asn Ser Cys Met Asp Pro Ile Val Tyr Cys Phe Val Thr Ser Gly Phe
 290 295 300
 Gln Ala Thr Val Arg Gly Leu Phe Gly Gln His Gly Glu Arg Glu Pro
 305 310 315 320
 10 Ser Ser Gly Asp Val Val Ser Met His Arg Ser Ser Lys Gly Ser Gly
 325 330 335
 Arg His His Ile Leu Ser Ala Gly Pro His Ala Leu Thr Gln Ala Leu
 340 345 350
 Ala Asn Gly Pro Glu Ala
 355

15 (42) INFORMATION FOR SEQ ID NO:41:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 30 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 20 (D) TOPOLOGY: linear
 (ii) MOLECULE TYPE: DNA (genomic)
 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:41:

GAGAAATTCAC TCCTGAGCTC AAGATGAACT 30

(43) INFORMATION FOR SEQ ID NO:42:

- 25 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 30 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
 (ii) MOLECULE TYPE: DNA (genomic)
 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:42:

CGGGATCCCC GTAAGTGAGC CACTTCAGAT 30

(44) INFORMATION FOR SEQ ID NO:43:

- 35 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 1050 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:43:

```

      ATGAACTCCA CCTTGGATGG TAATCAGAGC AGCCACCCTT TITGCCTCTT GGCATTGGC      60
5  TATTTTGGAAA CTGTCAATTT TTGCCTTTTG GAAGTATTGA TTATTGTCTT TCTAACTGTA      120
      TTGATTATTT CTGGCAACAT CATTGTGATT TTGTATTTC ACTGTGCACC TTGTGTGAAC      180
      CATCACACTA CAAGTTATTT TATCCAGACT ATGGCATATG CTGACCTTTT TGTGTGGGTG      240
      AGCTGCGTGG TCCCTTCTTT ATCACTCCTC CATCACCCCC TTCCAGTAGA GGAGTCCTTG      300
      ACTTGCCAGA TATTTGGITT TGTAGTATCA GTTCTGAAGA GCGTCTCCAT GGCTTCTCTG      360
10  GCCTGTATCA GCATTGATAG ATACATTGCC ATTAATAAAC CTTTAACTTA TAATACTCTG      420
      GTTACACCTT GGAGACTACG CCTGTGTATT TTCCTGATTT GGCTATACTC GACCTGGTTC      480
      TTCTGCCTT CTTTTTTCCA CTGGGGCRAA CCTGGATATC ATGGAGATGT GTTTCAGTGG      540
      TGTGCGGAGT CTTGGCACAC CGACTCCTAC TTCACCTGTG TCATCGTGAT GATGTTATAT      600
      GCCCCAGCAG CCCTTATTGT CTGCTTCACC TATTTCAACA TCCTTCGCAT CTGCCAACAG      660
15  CACACAAAGG ATATCAGCGA AAGGCCAAGC CGCTTCAGCA GCCAGAGTGG GGAGACTGGG      720
      GAAGTGCAGG CCGTCTCTGA TAAGCGCTAT GCCATGGTCC TGTTTCGAAT CACTAGTGTA      780
      TTTTACATCC TCTGGTTGCC ATATATCATC TACTTCTTGT TGGAAAGCTC CACTGGCCAC      840
      AGCAACCGCT TCGCATCCTT CTTGACCACC TGGCTTGCTA TTAGTAACAG TTTCTGCAAC      900
      TGTGTAATTT ATAGTCTCTC CAACAGTGTA TTCCAAAGAG GACTAAAGCG CCTCTCAGGG      960
20  GCTATGTGTA CTTCTTGTGC AAGTCAGACT ACAGCCAACG ACCCTTACAC AGTTAGAAGC      1020
      AAAGGCCCTC TTAATGGATG TCATATCTGA      1050

```

(45) INFORMATION FOR SEQ ID NO:44:

(i) SEQUENCE CHARACTERISTICS:

- 25 (A) LENGTH: 349 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:44:

30 Met Asn Ser Thr Leu Asp Gly Asn Gln Ser Ser His Pro Phe Cys Leu

35

	1	5	10	15
	Leu Ala Phe Gly Tyr Leu Glu Thr Val Asn Phe Cys Leu Leu Glu Val	20	25	30
5	Leu Ile Ile Val Phe Leu Thr Val Leu Ile Ile Ser Gly Asn Ile Ile	35	40	45
	Val Ile Phe Val Phe His Cys Ala Pro Leu Leu Asn His His Thr Thr	50	55	60
	Ser Tyr Phe Ile Gln Thr Met Ala Tyr Ala Asp Leu Phe Val Gly Val	65	70	75
10	Ser Cys Val Val Pro Ser Leu Ser Leu Leu His His Pro Leu Pro Val	85	90	95
	Glu Glu Ser Leu Thr Cys Gln Ile Phe Gly Phe Val Val Ser Val Leu	100	105	110
15	Lys Ser Val Ser Met Ala Ser Leu Ala Cys Ile Ser Ile Asp Arg Tyr	115	120	125
	Ile Ala Ile Thr Lys Pro Leu Thr Tyr Asn Thr Leu Val Thr Pro Trp	130	135	140
	Arg Leu Arg Leu Cys Ile Phe Leu Ile Trp Leu Tyr Ser Thr Leu Val	145	150	155
20	Phe Leu Pro Ser Phe Phe His Trp Gly Lys Pro Gly Tyr His Gly Asp	165	170	175
	Val Phe Gln Trp Cys Ala Glu Ser Trp His Thr Asp Ser Tyr Phe Thr	180	185	190
25	Leu Phe Ile Val Met Met Leu Tyr Ala Pro Ala Ala Leu Ile Val Cys	195	200	205
	Phe Thr Tyr Phe Asn Ile Phe Arg Ile Cys Gln Gln His Thr Lys Asp	210	215	220
	Ile Ser Glu Arg Gln Ala Arg Phe Ser Ser Gln Ser Gly Glu Thr Gly	225	230	235
30	Glu Val Gln Ala Cys Pro Asp Lys Arg Tyr Ala Met Val Leu Phe Arg	245	250	255
	Ile Thr Ser Val Phe Tyr Ile Leu Trp Leu Pro Tyr Ile Ile Tyr Phe	260	265	270
35	Leu Leu Glu Ser Ser Thr Gly His Ser Asn Arg Phe Ala Ser Phe Leu	275	280	285
	Thr Thr Trp Leu Ala Ile Ser Asn Ser Phe Cys Asn Cys Val Ile Tyr	290	295	300

Ser Leu Ser Asn Ser Val Phe Gln Arg Gly Leu Lys Arg Leu Ser Gly
 305 310 315 320

Ala Met Cys Thr Ser Cys Ala Ser Gln Thr Thr Ala Asn Asp Pro Tyr
 325 330 335

5 Thr Val Arg Ser Lys Gly Pro Leu Asn Gly Cys His Ile
 340 345

(46) INFORMATION FOR SEQ ID NO:45:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 30 base pairs
 10 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:45:

15 TCCCCCGGGA AAAAAACCAA CTGCTCCAAA 30

(47) INFORMATION FOR SEQ ID NO:46:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 31 base pairs
 20 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:46:

TAGGATCCAT TTGAATGTGG ATTGTGTGAA A 31

25 (48) INFORMATION FOR SEQ ID NO:47:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 1302 base pairs
 30 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:47:

ATGTGTTTT CTCCCCATTCT GGAAATCAAC ATGCAGTCTG AATCTAACAT TACAGTGC GA 60

GATGACATTG ATGACATCAA CACCAATATG TACCAACCAC TATCATATCC GTTAAAGCTTT 120

35 CAAGTGTCTC TCACCGGATT TCTTATGTTA GAAATTGTGT TGGGACTTGG CAGCAACCTC 180

	ACTGTATTGG TACTTTTACTG CATGAAATCC AACTTTAATCA ACTCTGTCAG TAACATTATT	240
	ACAATGAATC TTCATGTACT TGATGTAATA ATTTGTGTGG GATGTATTCC TCTAACTATA	300
	GTTATCCTTC TGCITTCAC TGGAGATTAAC ACTGCTCTCA TTTGCTGTTT CCATGAGGCT	360
	TGTGTATCTT TTGCAAGTGT CTCAACAGCA ATCAACGTTT TTGCTATCAC TTTGGACAGA	420
5	TATGACATCT CTGTAAACCC TGCAAAACCGA ATTCTGACAA TGGGCAGAGC TGTAATGTTA	480
	ATGATATCCA TTGGGATTTT TCTTTTTC TCTTTCCTGA TCTCTTTTAT TGAGGTAAT	540
	TTTTTCAGTC TTCAAAGTGG AAATACCTGG GAAAACAAGA CACTTTTATG TGTCACTACA	600
	AATGAATACT ACACCTGAAC GGAATGTAT TATCACTGT TAGTACAGAT CCCAATATTC	660
	TTTTTCACTG TTGTAGTAAT GTTAATCACA TACACCAAAA TACTTCAGGC TCTTAATATT	720
10	CGAATAGGCA CAAGATTTTC AACAGGGCAG AAGAAGAAAG CAAGAAGAA AAAGACAATT	780
	TCTCTAACCA CACAACATGA GGCTACAGAC ATGTACAAA GCAGTGGTGG GAGAAATGTA	840
	GTCTTTGGTG TAAGAACTTC AGTTTCTGTA ATAATTGCC CCGCGCAGC TGTGAAACGA	900
	CACCGTGAAC GACGAGAAAG ACAAAGAGA GTCTTCAGGA TGCTTTTATT GATTATTCT	960
	ACATTTCTTC TCTGCTGGAC ACCAATTTCT GTTTTAAATA CCACCATTTT ATGTTTAGGC	1020
15	CCAAGTGACC TTTTAGTAAA ATTAAGATTG TGTTTTTAG TCATGGCTTA TGGAACTACT	1080
	ATAATTCAAC CTCTATTATA TGCAITCACT AGACAAAAAT TTCAAAAGGT CTTGAAAAGT	1140
	AAAATGAAAA AGCGAGTTGT TTCTATAGTA GAAGCTGATC CCCTGCCTAA TAATGCTGTA	1200
	ATACACAACT CTTGGATAGA TCCCAAAGA AACAAAAAA TTACCTTTGA AGATAGTGAA	1260
	ATAAGAGAAA AACGTTTAGT GCCTCAGGTT GTCACAGACT AG	1302
20	(49) INFORMATION FOR SEQ ID NO:48:	
	(i) SEQUENCE CHARACTERISTICS:	
	(A) LENGTH: 433 amino acids	
	(B) TYPE: amino acid	
	(C) STRANDEDNESS:	
25	(D) TOPOLOGY: not relevant	
	(ii) MOLECULE TYPE: protein	
	(xi) SEQUENCE DESCRIPTION: SEQ ID NO:48:	
	Met Cys Phe Ser Pro Ile Leu Glu Ile Asn Met Gln Ser Glu Ser Asn	
	1 5 10 15	
30	Ile Thr Val Arg Asp Asp Ile Asp Asp Ile Asn Thr Asn Met Tyr Gln	
	20 25 30	

38

Pro Leu Ser Tyr Pro Leu Ser Phe Gln Val Ser Leu Thr Gly Phe Leu
35 40 45

Met Leu Glu Ile Val Leu Gly Leu Gly Ser Asn Leu Thr Val Leu Val
50 55 60

5 Leu Tyr Cys Met Lys Ser Asn Leu Ile Asn Ser Val Ser Asn Ile Ile
65 70 75 80

Thr Met Asn Leu His Val Leu Asp Val Ile Ile Cys Val Gly Cys Ile
85 90 95

10 Pro Leu Thr Ile Val Ile Leu Leu Leu Ser Leu Glu Ser Asn Thr Ala
100 105 110

Leu Ile Cys Cys Phe His Glu Ala Cys Val Ser Phe Ala Ser Val Ser
115 120 125

Thr Ala Ile Asn Val Phe Ala Ile Thr Leu Asp Arg Tyr Asp Ile Ser
130 135 140

15 Val Lys Pro Ala Asn Arg Ile Leu Thr Met Gly Arg Ala Val Met Leu
145 150 155 160

Met Ile Ser Ile Trp Ile Phe Ser Phe Phe Ser Phe Leu Ile Pro Phe
165 170 175

20 Ile Glu Val Asn Phe Phe Ser Leu Gln Ser Gly Asn Thr Trp Glu Asn
180 185 190

Lys Thr Leu Leu Cys Val Ser Thr Asn Glu Tyr Tyr Thr Glu Leu Gly
195 200 205

Met Tyr Tyr His Leu Leu Val Gln Ile Pro Ile Phe Phe Thr Val
210 215 220

25 Val Val Met Leu Ile Thr Tyr Thr Lys Ile Leu Gln Ala Leu Asn Ile
225 230 235 240

Arg Ile Gly Thr Arg Phe Ser Thr Gly Gln Lys Lys Lys Ala Arg Lys
245 250 255

30 Lys Lys Thr Ile Ser Leu Thr Thr Gln His Glu Ala Thr Asp Met Ser
260 265 270

Gln Ser Ser Gly Gly Arg Asn Val Val Phe Gly Val Arg Thr Ser Val
275 280 285

Ser Val Ile Ile Ala Leu Arg Arg Ala Val Lys Arg His Arg Glu Arg
290 295 300

35 Arg Glu Arg Gln Lys Arg Val Phe Arg Met Ser Leu Leu Ile Ile Ser
305 310 315 320

Thr Phe Leu Leu Cys Trp Thr Pro Ile Ser Val Leu Asn Thr Thr Ile

39

		325		330		335
	Leu Cys Leu Gly Pro Ser Asp Leu Leu Val Lys Leu Arg Leu Cys Phe					
		340		345		350
5	Leu Val Met Ala Tyr Gly Thr Thr Ile Phe His Pro Leu Leu Tyr Ala					
		355		360		365
	Phe Thr Arg Gln Lys Phe Gln Lys Val Leu Lys Ser Lys Met Lys Lys					
		370		375		380
	Arg Val Val Ser Ile Val Glu Ala Asp Pro Leu Pro Asn Asn Ala Val					
		385		390		400
10	Ile His Asn Ser Trp Ile Asp Pro Lys Arg Asn Lys Lys Ile Thr Phe					
		405		410		415
	Glu Asp Ser Glu Ile Arg Glu Lys Arg Leu Val Pro Gln Val Val Thr					
		420		425		430
15	Asp					

(50) INFORMATION FOR SEQ ID NO:49:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 30 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: single
 - (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:49:

GTGAAGCTTG CCTCTGGTGC CTGCAGGAGG

30

25 (51) INFORMATION FOR SEQ ID NO:50:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 31 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: single
 - (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:50:

GCAGAATTCC CGGTGGCGTG TTGTGGTGCC C

31

(52) INFORMATION FOR SEQ ID NO:51:

- 35 (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 1209 base pairs

(B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

5 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:51:

	ATGTTGTGTC	CTTCCAAGAC	AGATGGCTCA	GGGCACTCTG	GTAGGATTCA	CCAGGAAACT	60
	CATGGAGAAG	GGAAAAGGGA	CAAGATTAGC	AACAGTGAAG	GGAGGGAGAA	TGTTGGGAGA	120
	GGATTCCAGA	TGAACGGTGG	GTCGCTGGAG	GCTGAGCATG	CCAGCAGGAT	GTCAGTTCTC	180
	AGAGCAAAGC	CCATGTCAAA	CAGCCAACGC	TTGTCCTTC	TGTCCCCAGG	ATCACCTCCT	240
10	CGCACGGGGA	GCATCTCCTA	CATCAACATC	ATCATGCCTT	CGGTGTTTCG	CACCATCTGC	300
	CTCTGGGCA	TCATCGGAA	CTCCACGGTC	ATCTTCGCGG	TCGTGAAGAA	GTCCAAGCTG	360
	CACTGGTGCA	ACAACGTCCC	CGACATCTTC	ATCATCAACC	TCTCGGTAGT	AGATCTCCTC	420
	TTTCTCTCGG	GCATGCCCTT	CATGATCCAC	CAGCTCATGG	GCAATGGGGT	GTGGCACTTT	480
	GGGGAGACCA	TGTGCACCTT	CATCACGGCC	ATGGATGCCA	ATAGTCAGTT	CACCAGCACC	540
15	TACATCCTGA	CCGCCATGGC	CATTGACCGC	TACCTGGCCA	CTGTCCACCC	CATCTCTTCC	600
	ACGAAGTTCC	GGAAGCCCTC	TGTGGCCACC	CTGGTGATCT	GCCTCCTGTG	GGCCCTCTCC	660
	TTCATCAGCA	TCACCCCTGT	GTGGCTGTAT	GCCAGACTCA	TCCCCTTCCC	AGGAGGTGCA	720
	GTGGGCTGCG	GCATACGCCT	GCCCAACCCA	GACACTGACC	TCTACTGGTT	CACCCTGTAC	780
	CAGTTTTTCC	TGGCCTTTGC	CCTGCCTTTT	GTGGTCATCA	CAGCCGCATA	CGTGAGGATC	840
20	CTGCAGCGCA	TGACGTCCTC	AGTGGCCCCC	GCCTCCGAGC	GCAGCATCCG	GCTGCGGACA	900
	AAGAGGGTGA	CCCGCACAGC	CATCGCCATC	TGTCTGGTCT	TCTTTGTGTG	CTGGGCACCC	960
	TACTATGTGC	TACAGCTGAC	CCAGTTGTCC	ATCAGCCGCC	CGACCCCTCAC	CTTTGTCTAC	1020
	TTATACAATG	CGGCCATCAG	CTTGGGCTAT	GCCAACAGCT	GCCTCAACCC	CTTTGTGTAC	1080
	ATCGTGCTCT	GTGAGACGTT	CCGCAACAGC	TTGGTCCTGT	CGGTGAAGCC	TGCAGCCCAG	1140
25	GGGCAGCTTC	GCGCTGTCTG	CAACGCTCAG	ACGGCTGACG	AGGAGAGGAC	AGAAGAGCAA	1200
	GGCACCTGA						1209

(53) INFORMATION FOR SEQ ID NO:52:

(i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 402 amino acids
 (B) TYPE: amino acid

(C) STRANDEDNESS:

(D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:52:

5 Met Leu Cys Pro Ser Lys Thr Asp Gly Ser Gly His Ser Gly Arg Ile
 1 5 10 15
 His Gln Glu Thr His Gly Glu Gly Lys Arg Asp Lys Ile Ser Asn Ser
 20 25 30
 10 Glu Gly Arg Glu Asn Gly Gly Arg Gly Phe Gln Met Asn Gly Gly Ser
 35 40 45
 Leu Glu Ala Glu His Ala Ser Arg Met Ser Val Leu Arg Ala Lys Pro
 50 55 60
 Met Ser Asn Ser Gln Arg Leu Leu Leu Leu Ser Pro Gly Ser Pro Pro
 65 70 75 80
 15 Arg Thr Gly Ser Ile Ser Tyr Ile Asn Ile Ile Met Pro Ser Val Phe
 85 90 95
 Gly Thr Ile Cys Leu Leu Gly Ile Ile Gly Asn Ser Thr Val Ile Phe
 100 105 110
 20 Ala Val Val Lys Lys Ser Lys Leu His Trp Cys Asn Asn Val Pro Asp
 115 120 125
 Ile Phe Ile Ile Asn Leu Ser Val Val Asp Leu Leu Phe Leu Leu Gly
 130 135 140
 Met Pro Phe Met Ile His Gln Leu Met Gly Asn Gly Val Trp His Phe
 145 150 155 160
 25 Gly Glu Thr Met Cys Thr Leu Ile Thr Ala Met Asp Ala Asn Ser Gln
 165 170 175
 Phe Thr Ser Thr Tyr Ile Leu Thr Ala Met Ala Ile Asp Arg Tyr Leu
 180 185 190
 30 Ala Thr Val His Pro Ile Ser Ser Thr Lys Phe Arg Lys Pro Ser Val
 195 200 205
 Ala Thr Leu Val Ile Cys Leu Leu Trp Ala Leu Ser Phe Ile Ser Ile
 210 215 220
 Thr Pro Val Trp Leu Tyr Ala Arg Leu Ile Pro Phe Pro Gly Gly Ala
 225 230 235 240
 35 Val Gly Cys Gly Ile Arg Leu Pro Asn Pro Asp Thr Asp Leu Tyr Trp
 245 250 255

42

Phe Thr Leu Tyr Gln Phe Phe Leu Ala Phe Ala Leu Pro Phe Val Val
 260 265 270
 Ile Thr Ala Ala Tyr Val Arg Ile Leu Gln Arg Met Thr Ser Ser Val
 275 280 285
 5 Ala Pro Ala Ser Gln Arg Ser Ile Arg Leu Arg Thr Lys Arg Val Thr
 290 295 300
 Arg Thr Ala Ile Ala Ile Cys Leu Val Phe Phe Val Cys Trp Ala Pro
 305 310 315 320
 10 Tyr Tyr Val Leu Gln Leu Thr Gln Leu Ser Ile Ser Arg Pro Thr Leu
 325 330 335
 Thr Phe Val Tyr Leu Tyr Asn Ala Ala Ile Ser Leu Gly Tyr Ala Asn
 340 345 350
 Ser Cys Leu Asn Pro Phe Val Tyr Ile Val Leu Cys Glu Thr Phe Arg
 355 360 365
 15 Lys Arg Leu Val Leu Ser Val Lys Pro Ala Ala Gln Gly Gln Leu Arg
 370 375 380
 Ala Val Ser Asn Ala Gln Thr Ala Asp Glu Glu Arg Thr Glu Ser Lys
 385 390 395 400
 Gly Thr

20

(54) INFORMATION FOR SEQ ID NO:53:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 27 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
 25
 (ii) MOLECULE TYPE: DNA (genomic)
 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:53:

GGCGGATCCA TGGATGTGAC TTCCCAA

27

30 (55) INFORMATION FOR SEQ ID NO:54:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 27 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 35 (D) TOPOLOGY: linear
 (ii) MOLECULE TYPE: DNA (genomic)
 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:54:

GGCGGATCCC TACACGGCAC TGCTGAA

27

(56) INFORMATION FOR SEQ ID NO:55:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 1128 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:55:

10 ATGGATGTGA CTTCCCAAGC CCGGGGCGTG GGCCTGGAGA TGTACCCAGG CACCGCGCAC 60
 GCTGCGGCC CCAACACCAC CTCGCCGAG CTCAACCTGT CCCACCCGCT CTTGGGCACC 120
 GCCCTGGCCA ATGGGACAGG TGAGCTCTCG GAGCACCAGC AGTACGTGAT CGGCCTGTTC 180
 CTCTCGTGCC TCTACACCAT CTCTCTTTC CCCATCGGCT TTGTGGGCAA CATCCTGATC 240
 CTGGTGGTGA ACATCAGCTT CCGCGAGAAG ATGACCATCC CCGACCTGTA CTTTCATCAAC 300
 15 CTGGCGGTGG CGGACCTCAT CTGGTGGCC GACTCCCTCA TTGAGGTGTT CAACCTGCAC 360
 GAGCGGTACT ACGACATCGC CGTCTGTGC ACCTTCATGT CGCTCTTCCT GCAGGTCAAC 420
 ATGTACAGCA GCGTCTTCTT CCTCACCTGG ATGAGCTTCG ACCGTACAT CGCCCTGGCC 480
 AGGGCCATGC GCTGCAGCCT GTTCCGCACC AAGCACCAGC CCCGGCTGAG CTGTGGCCTC 540
 ATCTGGATGG CATCCGTGTC AGCCACGCTG GTGCCCTTCA CCGCCGTGCA CCTGCAGCAC 600
 20 ACCGACGAGG CCTGCTTCTG TTTCCGGAT GTCCGGGAGG TGCACTGGCT CGAGGTTCAG 660
 CTGGGCTTCA TCGTGCCCTT CGCCATCATC GGCCTGTGCT ACTCCCTCAT TGTCCGGGTG 720
 CTGGTCAGGG CGCACCGGCA CGTGGGCTG CGGCCCCGGC GGCAGAAGGC GCTCCGCATG 780
 ATCTCGCGG TGGTGCTGTT CTCTTCGTC TGCTGGCTGC CGGAGAAGCT CTTTCATCAGC 840
 GTGCACCTCC TGCAGCGGAG GCAGCCTGGG GCCGCTCCCT GCAAGCAGTC TTTCCGCCAT 900
 25 GCCCACCCCC TCAAGGGCCA CATTGTCAAC CTCGCCGCTT TCTCCAACAG CTGCCTAAAC 960
 CCCCTCATCT ACAGCTTTCT CGGGGAGACC TTCAGGGACA AGCTGAGGCT GTACATTGAG 1020
 CAGAAAACAA ATTTGCCGGC CTGAACCGC TTCTGTCACG CTGCCCTGAA GGCCTCATT 1080
 CCAGACAGCA CCGAGCAGTC GGATGTGAGG TTCAGCAGTG CCGTGTGA 1128

(57) INFORMATION FOR SEQ ID NO:56:

(i) SEQUENCE CHARACTERISTICS:

30

(A) LENGTH: 375 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

5 (ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:56:

	Met	Asp	Val	Thr	Ser	Gln	Ala	Arg	Gly	Val	Gly	Leu	Glu	Met	Tyr	Pro	
	1				5				10					15			
10	Gly	Thr	Ala	His	Ala	Ala	Ala	Pro	Asn	Thr	Thr	Ser	Pro	Glu	Leu	Asn	
				20					25					30			
	Leu	Ser	His	Pro	Leu	Leu	Gly	Thr	Ala	Leu	Ala	Asn	Gly	Thr	Gly	Glu	
			35					40					45				
	Leu	Ser	Glu	His	Gln	Gln	Tyr	Val	Ile	Gly	Leu	Phe	Leu	Ser	Cys	Leu	
			50				55					60					
15	Tyr	Thr	Ile	Phe	Leu	Phe	Pro	Ile	Gly	Phe	Val	Gly	Asn	Ile	Leu	Ile	
					70						75				80		
	Leu	Val	Val	Asn	Ile	Ser	Phe	Arg	Glu	Lys	Met	Thr	Ile	Pro	Asp	Leu	
				85						90					95		
20	Tyr	Phe	Ile	Asn	Leu	Ala	Val	Ala	Asp	Leu	Ile	Leu	Val	Ala	Asp	Ser	
				100						105					110		
	Leu	Ile	Glu	Val	Phe	Asn	Leu	His	Glu	Arg	Tyr	Tyr	Asp	Ile	Ala	Val	
				115					120					125			
	Leu	Cys	Thr	Phe	Met	Ser	Leu	Phe	Leu	Gln	Val	Asn	Met	Tyr	Ser	Ser	
				130				135					140				
25	Val	Phe	Phe	Leu	Thr	Trp	Met	Ser	Phe	Asp	Arg	Tyr	Ile	Ala	Leu	Ala	
						150					155				160		
	Arg	Ala	Met	Arg	Cys	Ser	Leu	Phe	Arg	Thr	Lys	His	His	Ala	Arg	Leu	
				165						170					175		
30	Ser	Cys	Gly	Leu	Ile	Trp	Met	Ala	Ser	Val	Ser	Ala	Thr	Leu	Val	Pro	
				180					185					190			
	Phe	Thr	Ala	Val	His	Leu	Gln	His	Thr	Asp	Glu	Ala	Cys	Phe	Cys	Phe	
				195				200					205				
	Ala	Asp	Val	Arg	Glu	Val	Gln	Trp	Leu	Glu	Val	Thr	Leu	Gly	Phe	Ile	
				210				215					220				
35	Val	Pro	Phe	Ala	Ile	Ile	Gly	Leu	Cys	Tyr	Ser	Leu	Ile	Val	Arg	Val	
				225			230				235				240		
	Leu	Val	Arg	Ala	His	Arg	His	Arg	Gly	Leu	Arg	Pro	Arg	Arg	Gln	Lys	

45

	245	250	255
	Ala Leu Arg Met Ile Leu Ala Val Val Leu Val Phe Phe Val Cys Trp		
	260	265	270
5	Leu Pro Glu Asn Val Phe Ile Ser Val His Leu Leu Gln Arg Thr Gln		
	275	280	285
	Pro Gly Ala Ala Pro Cys Lys Gln Ser Phe Arg His Ala His Pro Leu		
	290	295	300
	Thr Gly His Ile Val Asn Leu Ala Ala Phe Ser Asn Ser Cys Leu Asn		
	305	310	315
10	Pro Leu Ile Tyr Ser Phe Leu Gly Glu Thr Phe Arg Asp Lys Leu Arg		
	325	330	335
	Leu Tyr Ile Glu Gln Lys Thr Asn Leu Pro Ala Leu Asn Arg Phe Cys		
	340	345	350
15	His Ala Ala Leu Lys Ala Val Ile Pro Asp Ser Thr Glu Gln Ser Asp		
	355	360	365
	Val Arg Phe Ser Ser Ala Val		
	370	375	

(58) INFORMATION FOR SEQ ID NO:57:

- 20 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 31 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)

- 25 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:57:

AAGGAATTCA CGGCCGGGTG ATGCCATTCC C 31

(59) INFORMATION FOR SEQ ID NO:58:

- 30 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 30 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)

- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:58:

35 GGTGGATCCA TAAACACGGG CGTTGAGGAC 30

(60) INFORMATION FOR SEQ ID NO:59:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 960 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:59:

ATGCCATTCC CAAACTGCTC AGCCCCCAGC ACTGTGGTGG CCACAGCTGT GGGTGTCTTG 60
 CTGGGGCTGG AGTGTGGGCT GGGTCTGCTG GGCAACGCGG TGGCGCTGTG GACCTTCCTG 120
 10 TTCCGGGTCA GGGTGTGGAA GCCGTACGCT GTCTACCTGC TCAACCTGGC CCTGGCTGAC 180
 CTGCTGTTGG CTGCGTGCCT GCCTTTCCTG GCCGCTTCTT ACCTGAGCCT CCAGGCTTGG 240
 CATCTGGGCC GTGTGGGCTG CTGGGCCCTG CGCTTCCTGC TGGACCTCAG CCGCAGCGTG 300
 GGGATGGCCT TCCTGGCCCG CGTGGCTTTG GACCGGTACC TCCGTGTGGT CCACCTCTCG 360
 CTTAAGGTCA ACCTGTGTCT TCCTCAGGCG GCCCTGGGGG TCTCGGGCCT CGTCTGGCTC 420
 15 CTGATGGTCG CCTCACCCTG CCCGGGCTTG CTCATCTCTG AGGCCGCCCC GAACTCCACC 480
 AGGTGCCACA GTTTCTACTC CAGGGCAGAC GGCTCCTTCA GCATCATCTG GCAGGAAGCA 540
 CTCTCCTGCC TTCAGTTTGT CCTCCCCTTT GGCCTCATCG TGTCTTGCAA TGCAGGCATC 600
 ATCAGGGCTC TCCAGAAAAG ACTCCGGGAG CCTGAGAAAC AGCCCAAGCT TCACGGGGCC 660
 CAGGCACTGG TCACCTTGGT GGTGGTGCTG TTTGCTCTGT GCTTCTTGCC CTGCTTCCTG 720
 20 GCCAGAGTCC TGATGCACAT CTTCCAGAAT CTGGGGAGCT GCAGGGCCCT TTGTGCAGTG 780
 GCTCATACCT CGGATGTACG GGGCAGCCTC ACCTACCTGC ACAGTGTCTG CAACCCCGTG 840
 GTATACTGCT TCTCCAGCCC CACCTTCAGG AGCTCCTATC GGAGGGTCTT CCACACCTC 900
 CGAGGCAAAAG GGCAGGCAGC AGAGCCCCCA GATTTCARCC CCAGAGACTC CTATTCCTGA 960

(61) INFORMATION FOR SEQ ID NO:60:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 319 amino acids

(B) TYPE: amino acid

(C) STRANDEDNESS:

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:60:

Met Pro Phe Pro Asn Cys Ser Ala Pro Ser Thr Val Val Ala Thr Ala

47

	1		5		10		15									
	Val	Gly	Val	Leu	Leu	Gly	Leu	Glu	Cys	Gly	Leu	Gly	Leu	Leu	Gly	Asn
			20					25						30		
5	Ala	Val	Ala	Leu	Trp	Thr	Phe	Leu	Phe	Arg	Val	Arg	Val	Trp	Lys	Pro
			35					40					45			
	Tyr	Ala	Val	Tyr	Leu	Leu	Asn	Leu	Ala	Leu	Ala	Asp	Leu	Leu	Leu	Ala
			50				55					60				
	Ala	Cys	Leu	Pro	Phe	Leu	Ala	Ala	Phe	Tyr	Leu	Ser	Leu	Gln	Ala	Trp
		65				70					75				80	
10	His	Leu	Gly	Arg	Val	Gly	Cys	Trp	Ala	Leu	Arg	Phe	Leu	Leu	Asp	Leu
					85					90					95	
	Ser	Arg	Ser	Val	Gly	Met	Ala	Phe	Leu	Ala	Ala	Val	Ala	Leu	Asp	Arg
				100					105					110		
15	Tyr	Leu	Arg	Val	Val	His	Pro	Arg	Leu	Lys	Val	Asn	Leu	Leu	Ser	Pro
			115					120					125			
	Gln	Ala	Ala	Leu	Gly	Val	Ser	Gly	Leu	Val	Trp	Leu	Leu	Met	Val	Ala
			130				135					140				
	Leu	Thr	Cys	Pro	Gly	Leu	Leu	Ile	Ser	Glu	Ala	Ala	Gln	Asn	Ser	Thr
		145				150					155				160	
20	Arg	Cys	His	Ser	Phe	Tyr	Ser	Arg	Ala	Asp	Gly	Ser	Phe	Ser	Ile	Ile
					165					170					175	
	Trp	Gln	Glu	Ala	Leu	Ser	Cys	Leu	Gln	Phe	Val	Leu	Pro	Phe	Gly	Leu
			180					185					190			
25	Ile	Val	Phe	Cys	Asn	Ala	Gly	Ile	Ile	Arg	Ala	Leu	Gln	Lys	Arg	Leu
			195					200					205			
	Arg	Glu	Pro	Glu	Lys	Gln	Pro	Lys	Leu	Gln	Arg	Ala	Gln	Ala	Leu	Val
		210					215					220				
	Thr	Leu	Val	Val	Val	Leu	Phe	Ala	Leu	Cys	Phe	Leu	Pro	Cys	Phe	Leu
		225				230					235				240	
30	Ala	Arg	Val	Leu	Met	His	Ile	Phe	Gln	Asn	Leu	Gly	Ser	Cys	Arg	Ala
				245						250					255	
	Leu	Cys	Ala	Val	Ala	His	Thr	Ser	Asp	Val	Thr	Gly	Ser	Leu	Thr	Tyr
			260					265						270		
35	Leu	His	Ser	Val	Val	Asn	Pro	Val	Val	Tyr	Cys	Phe	Ser	Ser	Pro	Thr
			275					280					285			
	Phe	Arg	Ser	Ser	Tyr	Arg	Arg	Val	Phe	His	Thr	Leu	Arg	Gly	Lys	Gly
		290					295					300				

Gln Ala Ala Glu Pro Pro Asp Phe Asn Pro Arg Asp Ser Tyr Ser
 305 310 315

(62) INFORMATION FOR SEQ ID NO:61:

(i) SEQUENCE CHARACTERISTICS:

- 5 (A) LENGTH: 1143 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

10 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:61:

ATGGAGGAAG	GTGGTGATT	TGACAACTAC	TATGGGGCAG	ACAACCACTC	TGAGTGTGAG	60
TACACAGACT	GGAAATCCTC	GGGGGCCCTC	ATCCCTGCCA	TCTACATGTT	GGTCTTCCTC	120
CTGGGCACCA	CGGGAACCGG	TCTGGTGCTC	TGGACCGTGT	TTCGGAGCAG	CCGGGAGAAG	180
AGGCCTCTAG	CTGATATCTT	CATTGCTAGC	CTGGCCGTGG	CTGACCTGAC	CTTCGTGGTG	240
15 ACGCTGCCCC	TGTGGGCTAC	CTACACGTAC	CGGGAATATG	ACTGGCCCTT	TGGGACCTTC	300
TTCTGCAAGC	TCAGCAGCTA	CCTCATCTTC	GTCAACATGT	ACGCCACCGT	CTTCTGCCTC	360
ACCGGCCTCA	GCTTCGACCG	CTACCTGGCC	ATCGTGAGGC	CAGTGGCCAA	TGCTCGGGCTG	420
AGGCTGCGGG	TCAGCGGGGC	CGTGCCACG	GCAGTTCTTT	GGGTGCTGGC	CGCCCTCCTG	480
GCCATGCGCTG	TCATGGTGTT	ACGCACCACC	GGGGAATTTG	AGAACACCAC	TAAGGTGCAG	540
20 TGCTACATGG	ACTACTCCAT	GGTGCCACT	GTGAGCTCAG	AGTGGGCTTG	GGAGGTGGGC	600
CTTGGGGTCT	CGTCCACCAC	CGTGGGCTTT	GTGGTGCCCT	TCACCATCAT	GCTGACCTGT	660
TACTTCTTCA	TGCGCCAAAC	CATCGCTGGC	CACTTCCGCA	AGGAACGCAT	CGAGGGCTTG	720
CGGAAGCGGC	GCCGGTGCT	CAGCATCATC	GTGGTGCTGG	TGCTGACCTT	TGCCCTGTGC	780
TGGATGCCCT	ACCACCTGGT	GAAGACGCTG	TACATGCTGG	GCAGCTGCT	GCACTGGCCC	840
25 TGTGACTTTG	ACCTCTTCCT	CATGAACATC	TTCCTTACT	GCACCTGCAT	CAGCTACGTC	900
AACAGCTGCC	TCAACCCCTT	CCTCTATGCC	TTTTTCGACC	CCCGCTCCG	CCAGGCCCTGC	960
ACCTCCATGC	TCTGCTGTGG	CCAGAGCAGG	TGCGCAGGCA	CCTCCACAG	CAGCAGTGGG	1020
GAGAAGTCAG	CCAGCTACTC	TTCGGGGCAC	AGCCAGGGGC	CCGGCCCCAA	CATGGGCAAG	1080
GGTGGAGAAC	AGATGCACGA	GAAATCCATC	CCCTACAGCC	AGGAGACCTT	TGTGGTTGAC	1140
30 TAG						1143

(63) INFORMATION FOR SEQ ID NO:62:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 380 amino acids

(B) TYPE: amino acid

(C) STRANDEDNESS:

(D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:62:

Met Glu Glu Gly Gly Asp Phe Asp Asn Tyr Tyr Gly Ala Asp Asn Gln
 1 5 10 15
 Ser Glu Cys Glu Tyr Thr Asp Trp Lys Ser Ser Gly Ala Leu Ile Pro
 20 25 30
 Ala Ile Tyr Met Leu Val Phe Leu Leu Gly Thr Thr Gly Asn Gly Leu
 35 40 45
 Val Leu Trp Thr Val Phe Arg Ser Ser Arg Glu Lys Arg Arg Ser Ala
 50 55 60
 Asp Ile Phe Ile Ala Ser Leu Ala Val Ala Asp Leu Thr Phe Val Val
 65 70 75 80
 Thr Leu Pro Leu Trp Ala Thr Tyr Thr Tyr Arg Asp Tyr Asp Trp Pro
 85 90 95
 Phe Gly Thr Phe Phe Cys Lys Leu Ser Ser Tyr Leu Ile Phe Val Asn
 100 105 110
 Met Tyr Ala Ser Val Phe Cys Leu Thr Gly Leu Ser Phe Asp Arg Tyr
 115 120 125
 Leu Ala Ile Val Arg Pro Val Ala Asn Ala Arg Leu Arg Leu Arg Val
 130 135 140
 Ser Gly Ala Val Ala Thr Ala Val Leu Trp Val Leu Ala Ala Leu Leu
 145 150 155 160
 Ala Met Pro Val Met Val Leu Arg Thr Thr Gly Asp Leu Glu Asn Thr
 165 170 175
 Thr Lys Val Gln Cys Tyr Met Asp Tyr Ser Met Val Ala Thr Val Ser
 180 185 190
 Ser Glu Trp Ala Trp Glu Val Gly Leu Gly Val Ser Ser Thr Thr Val
 195 200 205
 Gly Phe Val Val Pro Phe Thr Ile Met Leu Thr Cys Tyr Phe Phe Ile
 210 215 220
 Ala Gln Thr Ile Ala Gly His Phe Arg Lys Glu Arg Ile Glu Gly Leu

50

	225		230		235		240
	Arg	Lys	Arg	Arg	Arg	Leu	Leu
			245			250	
	Arg	Lys	Arg	Arg	Arg	Leu	Leu
						255	
5	Phe	Ala	Leu	Cys	Trp	Met	Pro
			260			265	
	Phe	Ala	Leu	Cys	Trp	Met	Pro
						270	
	Leu	Gly	Ser	Leu	Leu	His	Trp
			275			280	
	Leu	Gly	Ser	Leu	Leu	His	Trp
						285	
	Asn	Ile	Phe	Pro	Tyr	Cys	Thr
			290			295	
	Asn	Ile	Phe	Pro	Tyr	Cys	Thr
						300	
10	Asn	Pro	Phe	Leu	Tyr	Ala	Phe
			305			310	
	Asn	Pro	Phe	Leu	Tyr	Ala	Phe
						315	
	Thr	Ser	Met	Leu	Cys	Cys	Gly
						325	
	Thr	Ser	Met	Leu	Cys	Cys	Gly
						330	
	Ser	Ser	Ser	Gly	Glu	Lys	Ser
			340			345	
15	Ser	Ser	Ser	Gly	Glu	Lys	Ser
						350	
	Gly	Pro	Gly	Pro	Asn	Met	Gly
			355			360	
	Gly	Pro	Gly	Pro	Asn	Met	Gly
						365	
	Ser	Ile	Pro	Tyr	Ser	Gln	Glu
			370			375	
	Ser	Ile	Pro	Tyr	Ser	Gln	Glu
						380	

20 (64) INFORMATION FOR SEQ ID NO:63:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 31 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

25

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:63:

TGAGAATTCT GGTGACTCAC AGCCGGCACA G

31

(65) INFORMATION FOR SEQ ID NO:64:

30

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 31 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

35

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:64:

GCCGGATCCA AGGAAAAGCA GCAATAAAAG G

31

(66) INFORMATION FOR SEQ ID NO:65:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 1119 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:65:

10 ATGAACTACC CGCTAACGCT GGAAATGGAC CTCGAGAACC TGGAGGACCT GTTCTGGGAA 60
 CTGGACAGAT TGGACAACCTA TAACGACACC TCCTTGGTGG AAAATCATCT CTGCCCTGCC 120
 ACAGAGGGTC CCCTCATGGC CTCCTTCAAG GCCGTGTTCTG TGCCCGTGGC CTACAGCCCTC 180
 ATCTTCTCTC TGGGCGTGAT CGGCAACGTC CTGGTGCTGG TGATCTTGGA GCGGCACCGG 240
 CAGACACGCA GTTCCACGGA GACCTTCTCTG TTCCACCTGG CCGTGCGCGA CCTCTGTCTG 300
 15 GTCTTCATCT TGCCCTTTGC CGTGGCGGAG GGCTCTGTGG GCTGGGTCTT GGGGACCTTC 360
 CTCTGCAAAA CTGTGATTGC CCTGCACAAA GTCAACTTCT ACTGCAGCAG CCTGTCTCTG 420
 GCCTGCATCG CCGTGGACCG CTACCTGGCC ATTGTCCACG CCGTCCATGC CTACCGCCAC 480
 CGCCGCCTCC TCTCCATCCA CATCACTGT GGGACCATCT GGTGGTGGG CTCTCTCTCT 540
 GCCTTGCCAG AGATTCTCTT CGCCAAAGTC AGCCAAAGGC ATCAACAACAA CTCCTTGCCA 600
 20 CGTTGCACCT TCTCCCAAGA GAACCAAGCA GAAACGCATG CCTGGTTTAC CTCCTGATTC 660
 CTCTACCATG TGGCGGGATT CCTGCTGCCC ATGCTGGTGA TGGGCTGGTG CTACGTGGGG 720
 GTAGTGACAC GGTTCGCCCA GGCCGAGCGG CGCCCTCAGC GGCAGAAAGG AGTCAGGGTG 780
 GCCATCTTGG TGACAAGCAT CTCTTCTCTC TGCTGGTCAC CCTACCATAT CGTCATCTTC 840
 CTGGACACCC TGGCGAGGCT GAAGGCCGTG GACAATACCT GCAAGCTGAA TGGCTCTCTC 900
 25 CCCGTGGCCA TCACCATGTG TGAGTTCTCTG GGCCTGGCCC ACTGCTGCCT CAACCCCATG 960
 CTCTACACTT TCGCGGCGGT GAAGTTCCCG AGTGACCTGT CGCGGCTCTT GACCAAGCTG 1020
 GGCTGTACCG GCCCTGCCTC CCTGTGCCAG CTCTTCCCTA GCTGGCGCAG GAGCAGTCTC 1080
 TCTGAGTCAG AGAATGCCAC CTCTCTCACC ACGTTCTAG 1119

(67) INFORMATION FOR SEQ ID NO:66:

(i) SEQUENCE CHARACTERISTICS:

52

- (A) LENGTH: 372 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

5 (ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:66:

	Met	Asn	Tyr	Pro	Leu	Thr	Leu	Glu	Met	Asp	Leu	Glu	Asn	Leu	Glu	Asp	
	1				5				10					15			
10	Leu	Phe	Trp	Glu	Leu	Asp	Arg	Leu	Asp	Asn	Tyr	Asn	Asp	Thr	Ser	Leu	
				20				25						30			
	Val	Glu	Asn	His	Leu	Cys	Pro	Ala	Thr	Glu	Gly	Pro	Leu	Met	Ala	Ser	
				35				40						45			
	Phe	Lys	Ala	Val	Phe	Val	Pro	Val	Ala	Tyr	Ser	Leu	Ile	Phe	Leu	Leu	
				50			55					60					
15	Gly	Val	Ile	Gly	Asn	Val	Leu	Val	Leu	Val	Ile	Leu	Glu	Arg	His	Arg	
				65			70				75				80		
	Gln	Thr	Arg	Ser	Ser	Thr	Glu	Thr	Phe	Leu	Phe	His	Leu	Ala	Val	Ala	
					85					90					95		
20	Asp	Leu	Leu	Leu	Val	Phe	Ile	Leu	Pro	Phe	Ala	Val	Ala	Glu	Gly	Ser	
					100				105					110			
	Val	Gly	Trp	Val	Leu	Gly	Thr	Phe	Leu	Cys	Lys	Thr	Val	Ile	Ala	Leu	
				115				120						125			
	His	Lys	Val	Asn	Phe	Tyr	Cys	Ser	Ser	Leu	Leu	Leu	Ala	Cys	Ile	Ala	
				130			135						140				
25	Val	Asp	Arg	Tyr	Leu	Ala	Ile	Val	His	Ala	Val	His	Ala	Tyr	Arg	His	
					145		150				155				160		
	Arg	Arg	Leu	Leu	Ser	Ile	His	Ile	Thr	Cys	Gly	Thr	Ile	Trp	Leu	Val	
					165				170					175			
30	Gly	Phe	Leu	Leu	Ala	Leu	Pro	Glu	Ile	Leu	Phe	Ala	Lys	Val	Ser	Gln	
				180					185					190			
	Gly	His	His	Asn	Asn	Ser	Leu	Pro	Arg	Cys	Thr	Phe	Ser	Gln	Glu	Asn	
				195			200						205				
	Gln	Ala	Glu	Thr	His	Ala	Trp	Phe	Thr	Ser	Arg	Phe	Leu	Tyr	His	Val	
				210			215						220				
35	Ala	Gly	Phe	Leu	Leu	Pro	Met	Leu	Val	Met	Gly	Trp	Cys	Tyr	Val	Gly	
				225			230				235				240		
	Val	Val	His	Arg	Leu	Arg	Gln	Ala	Gln	Arg	Arg	Pro	Gln	Arg	Gln	Lys	

53

	245	250	255
	Ala Val Arg Val Ala Ile Leu Val Thr Ser Ile Phe Phe Leu Cys Trp		
	260	265	270
5	Ser Pro Tyr His Ile Val Ile Phe Leu Asp Thr Leu Ala Arg Leu Lys		
	275	280	285
	Ala Val Asp Asn Thr Cys Lys Leu Asn Gly Ser Leu Pro Val Ala Ile		
	290	295	300
	Thr Met Cys Glu Phe Leu Gly Leu Ala His Cys Cys Leu Asn Pro Met		
	305	310	320
10	Leu Tyr Thr Phe Ala Gly Val Lys Phe Arg Ser Asp Leu Ser Arg Leu		
	325	330	335
	Leu Thr Lys Leu Gly Cys Thr Gly Pro Ala Ser Leu Cys Gln Leu Phe		
	340	345	350
15	Pro Ser Trp Arg Arg Ser Ser Leu Ser Glu Ser Glu Asn Ala Thr Ser		
	355	360	365
	Leu Thr Thr Phe		
	370		

(68) INFORMATION FOR SEQ ID NO:67:

- 20 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 30 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- 25 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:67:

CAAAGCTTGA AAGCTGCACG GTGCAGAGAC 30

(69) INFORMATION FOR SEQ ID NO:68:

- 30 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 30 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:68:

35 GCGGATCCCG AGTCACACCC TGGCTGGGCC 30

(70) INFORMATION FOR SEQ ID NO:69:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 1128 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:69:

ATGGATGTGA CTTCCCAAGC CCGGGGCGTG GGCTTGGAGA TGTACCCAGG CACCGCGCAG 60
 CCTGCGGCCC CCAACACCAC CTCCCCGAG CTCAACCTGT CCCACCCGCT CCTGGGCACC 120
 10 GCCCTGGCCA ATGGGACAGG TGAGCTCTCG GAGCACCAGC AGTACGTGAT CGGCCTGTTC 180
 CTCTCGTGCC TCTACACCAT CTCTCTTTC CCCATCGGCT TTGTGGGCAA CATCCTGATC 240
 CTGTGGTGA ACATCAGCTT CCGGAGAAG ATGACCATCC CCGACCTGTA CTTTCATCAAC 300
 CTGGCGGTGG CGGACCTCAT CTGGTGGCC GACTCCCTCA TTGAGGTGTT CAACCTGCAC 360
 GAGCGGTACT ACGACATCGC CGTCTGTGC ACCTTCATGT CGCTCTTCCT GCAGGTCAAC 420
 15 ATGTACAGCA GCGTCTTCTT CCTCACCTGG ATGAGCTTCG ACCGCTACAT CGCCCTGGCC 480
 AGGGCCATGC GCTGCAGCCT GTTCCGCACC AAGCACCACG CCCGGCTGAG CTGTGGCCTC 540
 ATCTGGATGG CATCCGTGTC AGCCACGCTG GTGCCCTTCA CCGCCGTGCA CCTGCAGCAC 600
 ACCGACGAGG CCGTCTTCTG TTTCGCGGAT GTCCGGGAGG TGCAGTGGCT CGAGGTCACG 660
 CTGGGCTTCA TCGTGCCCTT CGCCATCATC GGCCTGTGCT ACTCCCTCAT TGTCCGGGTG 720
 20 CTGGTCAGGG CGCACCAGCA CGTGGGCTG CGGCCCGGCG GGCAGAAGGC GCTCCGCATG 780
 ATCTCTCGCG TGCTGCTGGT CTTCTTCGTC TGCTGGCTGC CGGAGAAGCT CTTTCATCAGC 840
 GTGCACCTCC TGCAGCGGAC GCAGCCTGGG GCCGCTCCCT CCAAGCAGTC TTTCCGCCAT 900
 GCCCACCCTC TCACGGGCA CATTTGCAAC CTCACCGCCT TCTCCAACAG CTGCCTAAAC 960
 CCCCTCATCT ACAGCTTCTT CGGGGAGACC TTCAGGGACA AGCTGAGGCT GTACATTGAG 1020
 25 CAGAAAACAA ATTTGCCGGC CCTGAACCGC TTCTGTCAAG CTGCCCTGAA GGCCGTCATT 1080
 CCAGACAGCA CCGAGCAGTC GGATGTGAGG TTCAGCAGTC CCGTGTAG 1128

(71) INFORMATION FOR SEQ ID NO:70:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 375 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:70:

	Met	Asp	Val	Thr	Ser	Gln	Ala	Arg	Gly	Val	Gly	Leu	Glu	Met	Tyr	Pro	
	1				5				10					15			
5	Gly	Thr	Ala	Gln	Pro	Ala	Ala	Pro	Asn	Thr	Thr	Ser	Pro	Glu	Leu	Asn	
				20				25					30				
	Leu	Ser	His	Pro	Leu	Leu	Gly	Thr	Ala	Leu	Ala	Asn	Gly	Thr	Gly	Glu	
			35				40					45					
10	Leu	Ser	Glu	His	Gln	Gln	Tyr	Val	Ile	Gly	Leu	Phe	Leu	Ser	Cys	Leu	
	50						55				60						
	Tyr	Thr	Ile	Phe	Leu	Phe	Pro	Ile	Gly	Phe	Val	Gly	Asn	Ile	Leu	Ile	
	65				70				75					80			
	Leu	Val	Val	Asn	Ile	Ser	Phe	Arg	Glu	Lys	Met	Thr	Ile	Pro	Asp	Leu	
				85				90					95				
15	Tyr	Phe	Ile	Asn	Leu	Ala	Val	Ala	Asp	Leu	Ile	Leu	Val	Ala	Asp	Ser	
				100				105					110				
	Leu	Ile	Glu	Val	Phe	Asn	Leu	His	Glu	Arg	Tyr	Tyr	Asp	Ile	Ala	Val	
			115				120					125					
20	Leu	Cys	Thr	Phe	Met	Ser	Leu	Phe	Leu	Gln	Val	Asn	Met	Tyr	Ser	Ser	
	130					135					140						
	Val	Phe	Phe	Leu	Thr	Trp	Met	Ser	Phe	Asp	Arg	Tyr	Ile	Ala	Leu	Ala	
	145				150					155				160			
	Arg	Ala	Met	Arg	Cys	Ser	Leu	Phe	Arg	Thr	Lys	His	His	Ala	Arg	Leu	
				165				170					175				
25	Ser	Cys	Gly	Leu	Ile	Trp	Met	Ala	Ser	Val	Ser	Ala	Thr	Leu	Val	Pro	
			180				185						190				
	Phe	Thr	Ala	Val	His	Leu	Gln	His	Thr	Asp	Glu	Ala	Cys	Phe	Cys	Phe	
		195				200						205					
30	Ala	Asp	Val	Arg	Glu	Val	Gln	Trp	Leu	Glu	Val	Thr	Leu	Gly	Phe	Ile	
	210					215					220						
	Val	Pro	Phe	Ala	Ile	Ile	Gly	Leu	Cys	Tyr	Ser	Leu	Ile	Val	Arg	Val	
	225				230				235					240			
	Leu	Val	Arg	Ala	His	Arg	His	Arg	Gly	Leu	Arg	Pro	Arg	Arg	Gln	Lys	
				245				250					255				
35	Ala	Leu	Arg	Met	Ile	Leu	Ala	Val	Val	Leu	Val	Phe	Phe	Val	Cys	Trp	
			260				265						270				

56

Leu Pro Glu Asn Val Phe Ile Ser Val His Leu Leu Gln Arg Thr Gln
 275 280 285
 Pro Gly Ala Ala Pro Cys Lys Gln Ser Phe Arg His Ala His Pro Leu
 290 295 300
 5 Thr Gly His Ile Val Asn Leu Thr Ala Phe Ser Asn Ser Cys Leu Asn
 305 310 315 320
 Pro Leu Ile Tyr Ser Phe Leu Gly Glu Thr Phe Arg Asp Lys Leu Arg
 325 330 335
 10 Leu Tyr Ile Glu Gln Lys Thr Asn Leu Pro Ala Leu Asn Arg Phe Cys
 340 345 350
 His Ala Ala Leu Lys Ala Val Ile Pro Asp Ser Thr Glu Gln Ser Asp
 355 360 365
 Val Arg Phe Ser Ser Ala Val
 370 375

15 (72) INFORMATION FOR SEQ ID NO:71:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 30 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

20 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:71:

ACAGAATTCC TGTGTGGTTT TACGCCCAG

30

(73) INFORMATION FOR SEQ ID NO:72:

25 (i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 30 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

30 (ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:72:

CTCGGATCCA GGCAGAAGAG TCGCCTATGG

30

(74) INFORMATION FOR SEQ ID NO:73:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 1137 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

35

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:73:

ATGGACCTGG GGAACCAAT GAAAGCGTG CTGGTGGTGG CTCTCCTTGT CATTTCACAG 60
 5 GTATGCTGT GTCAAGATGA GGTACGGAC GATTACATCG GAGACAACAC CACAGTGGAC 120
 TACACTTTGT TCGAGTCTTT GTGCTCCAAG AAGGACGTGC GGAACTTTAA AGCCTGGTTC 180
 CTCCTATCA TGTACTCCAT CATTGTTC GTGGCCTAC TGGGCAATGG GCTGTCGTG 240
 TTGACCTATA TCTATTCAA GAGGCTCAAG ACCATGACCG ATACCTACCT GCTCAACCTG 300
 GCGGTGGCAG ACATCCTCTT CCTCCTGACC CTTCCTTCT GGGCCTACAG CGCGGCCAAG 360
 10 TCCTGGGTCT TCGGTGTCCA CTTTGC AAG CTATCTTTG CCATCTACAA GATGAGCTTC 420
 TTCAGTGGCA TGCTCCTACT TCTTTGCATC AGCATTGACC GCTACGTGGC CATCGTCCAG 480
 GCTGTCTCAG CTCACCGCCA CCGTGCCCGC GTCCTTCTCA TCAGCAAGCT GTCCGTGTGTG 540
 GGCATCTGGA TACTAGCCAC AGTGCTCTCC ATCCAGAGC TCCTGTACAG TGACCTCCAG 600
 AGGAGCAGCA GTGAGCAAGC GATGCGATGC TCTCTCATCA CAGAGCATGT GGAGGCCCTT 660
 15 ATCACCATCC AGGTGGCCCA GATGGTGATC GGCTTTCTGG TCCCCCTGCT GGCCATGAGC 720
 TTCTGTTACC TTGTTCATCAT CCGCACCCTG CTCAGGCAC GCAACTTTGA GCGCAACAAG 780
 GCCATCAAGG TGATCATCGC TGTGGTCGTG GTCTTCATAG TCTTCCAGCT GCCCTACAA 840
 GGGGTGGTCC TGGCCAGAC GGTGGCCAAC TTCAACATCA CCAGTAGCAC CTGTGAGCTC 900
 AGTAAGCAAC TCAACATCGC CTACGACGTC ACCTACAGCC TGGCCTGCGT CCGCTGCTGC 960
 20 GTCAACCCTT TCTGTACGC CTTATCGGC GTCAAGTTCC GCAACGATCT CTTCAAGCTC 1020
 TTCAAGGACC TGGGCTGCCT CAGCCAGGAG CAGCTCCGGC AGTGGTCTTC CTGTGCGCAC 1080
 ATCCGCGCT CCTCATGAG TGTGGAGGCC GAGACCACCA CCACCTTCTC CCCATG 1137

(75) INFORMATION FOR SEQ ID NO:74:

25 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 378 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

30 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:74:

Met Asp Leu Gly Lys Pro Met Lys Ser Val Leu Val Val Ala Leu Leu
 1 5 10 15

Val Ile Phe Gln Val Cys Leu Cys Cln Asp Glu Val Thr Asp Asp Tyr
 20 25 30

5 Ile Gly Asp Asn Thr Thr Val Asp Tyr Thr Leu Phe Glu Ser Leu Cys
 35 40 45

Ser Lys Lys Asp Val Arg Asn Phe Lys Ala Trp Phe Leu Pro Ile Met
 50 55 60

10 Tyr Ser Ile Ile Cys Phe Val Gly Leu Leu Gly Asn Gly Leu Val Val
 65 70 75 80

Leu Thr Tyr Ile Tyr Phe Lys Arg Leu Lys Thr Met Thr Asp Thr Tyr
 85 90 95

Leu Leu Asn Leu Ala Val Ala Asp Ile Leu Phe Leu Leu Thr Leu Pro
 100 105 110

15 Phe Trp Ala Tyr Ser Ala Ala Lys Ser Trp Val Phe Gly Val His Phe
 115 120 125

Cys Lys Leu Ile Phe Ala Ile Tyr Lys Met Ser Phe Phe Ser Gly Met
 130 135 140

20 Leu Leu Leu Leu Cys Ile Ser Ile Asp Arg Tyr Val Ala Ile Val Gln
 145 150 155 160

Ala Val Ser Ala His Arg His Arg Ala Arg Val Leu Leu Ile Ser Lys
 165 170 175

Leu Ser Cys Val Gly Ile Trp Ile Leu Ala Thr Val Leu Ser Ile Pro
 180 185 190

25 Glu Leu Leu Tyr Ser Asp Leu Gln Arg Ser Ser Ser Glu Gln Ala Met
 195 200 205

Arg Cys Ser Leu Ile Thr Glu His Val Glu Ala Phe Ile Thr Ile Gln
 210 215 220

30 Val Ala Gln Met Val Ile Gly Phe Leu Val Pro Leu Leu Ala Met Ser
 225 230 235 240

Phe Cys Tyr Leu Val Ile Ile Arg Thr Leu Leu Gln Ala Arg Asn Phe
 245 250 255

Glu Arg Asn Lys Ala Ile Lys Val Ile Ile Ala Val Val Val Val Phe
 260 265 270

35 Ile Val Phe Gln Leu Pro Tyr Asn Gly Val Val Leu Ala Gln Thr Val
 275 280 285

59

Ala Asn Phe Asn Ile Thr Ser Ser Thr Cys Glu Leu Ser Lys Gln Leu
 290 295 300

Asn Ile Ala Tyr Asp Val Thr Tyr Ser Leu Ala Cys Val Arg Cys Cys
 305 310 315 320

5 Val Asn Pro Phe Leu Tyr Ala Phe Ile Gly Val Lys Phe Arg Asn Asp
 325 330 335

Leu Phe Lys Leu Phe Lys Asp Leu Gly Cys Leu Ser Gln Glu Gln Leu
 340 345 350

10 Arg Gln Trp Ser Ser Cys Arg His Ile Arg Arg Ser Ser Met Ser Val
 355 360 365

Glu Ala Glu Thr Thr Thr Thr Phe Ser Pro
 370 375

(76) INFORMATION FOR SEQ ID NO:75:

- 15 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 32 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- 20 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:75:

CTGGAATTCA CCTGGACCAC CACCAATGGA TA

32

(77) INFORMATION FOR SEQ ID NO:76:

- 25 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 30 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:76:

30 CTCGGATCCT GCAAGTTTG TCATACAGTT

30

(78) INFORMATION FOR SEQ ID NO:77:

- 35 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 1085 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:77:

ATGGATATAC AAATGGCAAA CAATTTTACT CCGCCCTCTG CAATCTCTCA GGGAAATGAC 60
 TGTGACCTCT ATGCACATCA CAGCACGGCC AGGATAGTAA TGCCTCTGCA TTACAGCCTC 120
 GTCTTCATCA TTGGGCTCGT GGGAACTTA CTAGCCTTGG TCGTCATTGT TCAAAACAGG 180
 5 AAAAAATCA ACTCTACCAC CCTCTATTCA ACAAATTGG TGATTCTCTA TATACTTTTT 240
 ACCACGGCCT TGCTTACACG AATAGCCTAC TATGCAATGG GCTTTGACTG GAGAATCGGA 300
 GATGCTCTGT GTAGGATAAC TGCCTAGTGT TTTTACATCA ACACATATGC AGGTGTGAAC 360
 TTTATGACCT GCCTGAGTAT TGACCGCTTC ATTGCTGTGG TGCACCTCTT ACGCTACAAC 420
 AAGATAAAAA GGATTGAACA TGCAAAAGGC GTGTGCATAT TTGTCTGGAT TCTAGTATTT 480
 10 GCTCAGACAC TCCCACTCCT CATCAACCCT ATGTCAAAGC AGGAGGCTGA AAGGATTACA 540
 TGCATGGAGT ATCCAAACTT TGAAGAAACT AAATCTCTTC CCTGGATTCT GCTTGGGGCA 600
 TGTTCATAG GATATGTACT TCCACTTATA ATCATTCTCA TCTGCTATTG TCAGATCTGC 660
 TGCAACTCT TCAGAACTGC CAAACAAAC CCACTCACTG AGAAATCTGG TGTAACAAA 720
 AAGGCTCTCA ACACAATTAT TCTTATTATT GTTGTGTTTG TTCTCTGTTT CACACCTTAC 780
 15 CATGTTGCAA TTATTCAACA TATGATTAAG AAGCTTCGTT TCTCTAATTT CCTGGAATGT 840
 AGCCAAAGAC ATTCGTTCCA GATTCTCTG CACTTTACAG TATGCTGAT GAACCTCAAT 900
 TGCTGCATGG ACCCTTTTAT CTACTTCTTT GCATGTAAAG GGTATAAGAG AAAGGTTATG 960
 AGGATGCTGA AACGGCAAGT CAGTGATATC ATTTCTAGTG CTGTGAAGTC AGCCCTGAA 1020
 GAAATTCAC GTGAAATGAC AGAAACGCAG ATGATGATAC ATTCCAAGTC TTCAAATGGA 1080
 20 AAGTGA 1086

(79) INFORMATION FOR SEQ ID NO:78:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 361 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:78:

Met Asp Ile Gln Met Ala Asn Asn Phe Thr Pro Pro Ser Ala Thr Pro
 1 5 10 15

61

	Gln	Gly	Asn	Asp	Cys	Asp	Leu	Tyr	Ala	His	His	Ser	Thr	Ala	Arg	Ile	
				20					25						30		
	Val	Met	Pro	Leu	His	Tyr	Ser	Leu	Val	Phe	Ile	Ile	Gly	Leu	Val	Gly	
			35					40					45				
5	Asn	Leu	Leu	Ala	Leu	Val	Val	Ile	Val	Gln	Asn	Arg	Lys	Lys	Ile	Asn	
	50					55					60						
	Ser	Thr	Thr	Leu	Tyr	Ser	Thr	Asn	Leu	Val	Ile	Ser	Asp	Ile	Leu	Phe	
	65				70					75					80		
10	Thr	Thr	Ala	Leu	Pro	Thr	Arg	Ile	Ala	Tyr	Tyr	Ala	Met	Gly	Phe	Asp	
				85						90					95		
	Trp	Arg	Ile	Gly	Asp	Ala	Leu	Cys	Arg	Ile	Thr	Ala	Leu	Val	Phe	Tyr	
				100					105					110			
	Ile	Asn	Thr	Tyr	Ala	Gly	Val	Asn	Phe	Met	Thr	Cys	Leu	Ser	Ile	Asp	
			115					120					125				
15	Arg	Phe	Ile	Ala	Val	Val	His	Pro	Leu	Arg	Tyr	Asn	Lys	Ile	Lys	Arg	
			130				135					140					
	Ile	Glu	His	Ala	Lys	Gly	Val	Cys	Ile	Phe	Val	Trp	Ile	Leu	Val	Phe	
	145				150					155					160		
20	Ala	Gln	Thr	Leu	Pro	Leu	Leu	Ile	Asn	Pro	Met	Ser	Lys	Gln	Glu	Ala	
				165						170					175		
	Glu	Arg	Ile	Thr	Cys	Met	Glu	Tyr	Pro	Asn	Phe	Glu	Glu	Thr	Lys	Ser	
			180					185					190				
	Leu	Pro	Trp	Ile	Leu	Leu	Gly	Ala	Cys	Phe	Ile	Gly	Tyr	Val	Leu	Pro	
			195				200						205				
25	Leu	Ile	Ile	Ile	Leu	Ile	Cys	Tyr	Ser	Gln	Ile	Cys	Cys	Lys	Leu	Phe	
			210				215						220				
	Arg	Thr	Ala	Lys	Gln	Asn	Pro	Leu	Thr	Glu	Lys	Ser	Gly	Val	Asn	Lys	
	225				230					235					240		
30	Lys	Ala	Leu	Asn	Thr	Ile	Ile	Leu	Ile	Ile	Val	Val	Phe	Val	Leu	Cys	
				245						250					255		
	Phe	Thr	Pro	Tyr	His	Val	Ala	Ile	Ile	Gln	His	Met	Ile	Lys	Lys	Leu	
			260					265						270			
	Arg	Phe	Ser	Asn	Phe	Leu	Glu	Cys	Ser	Gln	Arg	His	Ser	Phe	Gln	Ile	
			275					280					285				
35	Ser	Leu	His	Phe	Thr	Val	Cys	Leu	Met	Asn	Phe	Asn	Cys	Cys	Met	Asp	
		290					295					300					
	Pro	Phe	Ile	Tyr	Phe	Phe	Ala	Cys	Lys	Gly	Tyr	Lys	Arg	Lys	Val	Met	

62

305		310		315		320
Arg Met Leu Lys Arg Gln Val Ser Val Ser Ile Ser Ser Ala Val Lys						
	325		330		335	
5 Ser Ala Pro Glu Glu Asn Ser Arg Glu Met Thr Glu Thr Gln Met Met						
	340		345		350	
Ile His Ser Lys Ser Ser Asn Gly Lys						
	355		360			

(80) INFORMATION FOR SEQ ID NO:79:

- 10 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 31 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- 15 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:79:

CTGGAATTCT CCTGCTCATC CAGCCATGCG G 31

(81) INFORMATION FOR SEQ ID NO:80:

- 20 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 30 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:80:

25 CCTGGATCCC CACCCTACT GGGCCTCAG 30

(82) INFORMATION FOR SEQ ID NO:81:

- 30 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 1446 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:81:

ATGCGGTGGC TGTGGCCCTT GGCTGTCTCT CTGCTGTGA TTTGGCTGT GGGGCTAAGC 60

35 AGGGTCTCTG GGGGTGCCCC CTGCACCTG GGCAGGCACA GAGCCGAGAC CCAGGAGCAG 120

	CAGAGCCGAT CCAAGAGGGG CACCGAGGAT GAGGAGGCCA AGGGCGTGCA GCAGTATGTG	180
	CCTGAGGAGT GGGCGGAGTA CCCCCGGCCC ATTCAACCCTG CTGGCCTGCA GCCAACCAAG	240
	CCCTTGGTGG CCACCAGCCC TAACCCCGAC AAGGATGGGG GCACCCAGCA CAGTGGGCA	300
	GAACTGAGGG GCAATCTGAC AGGGGCACCA GGGCAGAGGC TACAGATCCA GAACCCCTCTG	360
5	TATCCGGTGA CCGAGAGCTC CTACAGTGCC TATGCCATCA TGCTTCTGGC GCTGGTGGTG	420
	TTTGGCTGGG GCATTGTGGG CAACCTGTCTG GTCATGTGCA TCGTGTGGCA CAGCTACTAC	480
	CTGAAGAGCG CCTGGAACCT CATCCTTGCC AGCCTGGCCC TCTGGGATT TCTGGTCTCTC	540
	TTTTTCTGCC TCCCTATTGT CATCTTCAAC GAGATCACCA AGCAGAGGCT ACTGGGTGAC	600
	GTTTCTTGTC GTGCCGTGCC CTTCATGGAG GTCTCCTCTC TGGGAGTCAC GACTTTCAGC	660
10	CTCTGTGCC TGGGCATTGA CCGCTTCCAC GTGGCCACCA GCACCTCGCC CAAGGTGAGG	720
	CCCATCGAGC GGTGCCAATC CATCCTGGCC AAGTTGGCTG TCATCTGGGT GGGCTCCATG	780
	ACGCTGGCTG TGCCGTGAGCT CCGCTGTGG CAGCTGGCAC AGGAGCCTGC CCCACCATG	840
	GGCACCCCTGG ACTCATGCAT CATGAAACCC TCAGCCAGCC TGCCCGAGTC CCTGTATTCA	900
	CTGGTGATGA CCTACCAGAA CGCCCGCATG TGGTGGTACT TTGGCTGCTA CTTCTGCCTG	960
15	CCCATCCTCT TCACAGTCAC CTGCCAGCTG GTGACATGGC GGGTGCAGAG CCCTCCAGGG	1020
	AGGAAGTCAG AGTGCAGGGC CAGCAAGCAC GAGCAGTGTG AGAGCCAGCT CAACAGCACC	1080
	GTGGTGGGCC TGACCGTGGT CTACGCCTTC TGCACCTCC CAGAGAACGT CTGCAACATC	1140
	GTGGTGGCCT ACCTCTCCAC CGAGCTGACC CGCCAGACCC TGGACCTCCT GGCCTCATC	1200
	AACCAGTTCT CCACCTTCT CAAGGGCGCC ATCACCCAG TGCTGCTCCT TTGCATCTGC	1260
20	AGGCCGCTGG GCCAGGCCCT CCTGGACTGC TGCTGCTGCT GCTGCTGTGA GAGGTGCGGC	1320
	GGGGCTTCGG AGGCCCTGTC TGCCAATGGG TCGGACAACA AGCTCAAGAC CGAGGTGTCC	1380
	TCTTCCATCT ACTTCCACAA GCCCAGGGAG TCACCCAC TCCTGCCCTT GGCACACCT	1440
	TGCTGA	1446

(83) INFORMATION FOR SEQ ID NO:82:

- 25 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 481 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

- 30 (ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:82:

	Met	Arg	Trp	Leu	Trp	Pro	Leu	Ala	Val	Ser	Leu	Ala	Val	Ile	Leu	Ala	
	1				5					10					15		
5	Val	Gly	Leu	Ser	Arg	Val	Ser	Gly	Gly	Ala	Pro	Leu	His	Leu	Gly	Arg	
			20					25					30				
	His	Arg	Ala	Glu	Thr	Gln	Glu	Gln	Gln	Ser	Arg	Ser	Lys	Arg	Gly	Thr	
			35					40					45				
	Glu	Asp	Glu	Glu	Ala	Lys	Gly	Val	Gln	Gln	Tyr	Val	Pro	Glu	Glu	Trp	
		50					55					60					
10	Ala	Glu	Tyr	Pro	Arg	Pro	Ile	His	Pro	Ala	Gly	Leu	Gln	Pro	Thr	Lys	
	65					70					75				80		
	Pro	Leu	Val	Ala	Thr	Ser	Pro	Asn	Pro	Asp	Lys	Asp	Gly	Gly	Thr	Pro	
					85				90				95				
15	Asp	Ser	Gly	Gln	Glu	Leu	Arg	Gly	Asn	Leu	Thr	Gly	Ala	Pro	Gly	Gln	
			100					105					110				
	Arg	Leu	Gln	Ile	Gln	Asn	Pro	Leu	Tyr	Pro	Val	Thr	Glu	Ser	Ser	Tyr	
			115					120					125				
	Ser	Ala	Tyr	Ala	Ile	Met	Leu	Leu	Ala	Leu	Val	Val	Phe	Ala	Val	Gly	
		130					135					140					
20	Ile	Val	Gly	Asn	Leu	Ser	Val	Met	Cys	Ile	Val	Trp	His	Ser	Tyr	Tyr	
	145				150					155					160		
	Leu	Lys	Ser	Ala	Trp	Asn	Ser	Ile	Leu	Ala	Ser	Leu	Ala	Leu	Trp	Asp	
				165					170				175				
25	Phe	Leu	Val	Leu	Phe	Phe	Cys	Leu	Pro	Ile	Val	Ile	Phe	Asn	Glu	Ile	
			180					185					190				
	Thr	Lys	Gln	Arg	Leu	Leu	Gly	Asp	Val	Ser	Cys	Arg	Ala	Val	Pro	Phe	
			195				200						205				
	Met	Glu	Val	Ser	Ser	Leu	Gly	Val	Thr	Thr	Phe	Ser	Leu	Cys	Ala	Leu	
		210					215					220					
30	Gly	Ile	Asp	Arg	Phe	His	Val	Ala	Thr	Ser	Thr	Leu	Pro	Lys	Val	Arg	
	225				230						235				240		
	Pro	Ile	Glu	Arg	Cys	Gln	Ser	Ile	Leu	Ala	Lys	Leu	Ala	Val	Ile	Trp	
				245					250					255			
35	Val	Gly	Ser	Met	Thr	Leu	Ala	Val	Pro	Glu	Leu	Leu	Leu	Trp	Gln	Leu	
			260					265					270				
	Ala	Gln	Glu	Pro	Ala	Pro	Thr	Met	Gly	Thr	Leu	Asp	Ser	Cys	Ile	Met	

65

	275	280	285
	Lys Pro Ser Ala Ser Leu Pro	Glu Ser Leu Tyr Ser	Leu Val Met Thr
	290	295	300
5	Tyr Gln Asn Ala Arg Met Trp Trp Tyr Phe Gly Cys Tyr Phe Cys Leu		
	305	310	315 320
	Pro Ile Leu Phe Thr Val Thr Cys Gln Leu Val Thr Trp Arg Val Arg		
		325	330 335
	Gly Pro Pro Gly Arg Lys Ser Glu Cys Arg Ala Ser Lys His Glu Gln		
		340	345 350
10	Cys Glu Ser Gln Leu Asn Ser Thr Val Val Gly Leu Thr Val Val Tyr		
		355	360 365
	Ala Phe Cys Thr Leu Pro Glu Asn Val Cys Asn Ile Val Val Ala Tyr		
		370	375 380
15	Leu Ser Thr Glu Leu Thr Arg Gln Thr Leu Asp Leu Leu Gly Leu Ile		
		385	390 395 400
	Asn Gln Phe Ser Thr Phe Phe Lys Gly Ala Ile Thr Pro Val Leu Leu		
		405	410 415
	Leu Cys Ile Cys Arg Pro Leu Gly Gln Ala Phe Leu Asp Cys Cys Cys		
		420	425 430
20	Cys Cys Cys Cys Glu Glu Cys Gly Gly Ala Ser Glu Ala Ser Ala Ala		
		435	440 445
	Asn Gly Ser Asp Asn Lys Leu Lys Thr Glu Val Ser Ser Ser Ile Tyr		
		450	455 460
25	Phe His Lys Pro Arg Glu Ser Pro Pro Leu Leu Pro Leu Gly Thr Pro		
		465	470 475 480
	Cys		

(84) INFORMATION FOR SEQ ID NO:83:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 22 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:83:

ATGTGGAACG CGACGCCACG CG

22

(85) INFORMATION FOR SEQ ID NO:84:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 22 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:84:

TCATGTATTA ATACTAGATT CT

22

10 (86) INFORMATION FOR SEQ ID NO:85:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 38 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:85:

TACCATGTGG AACGCGACGC CCAGCGAAGA GCCGGGGT

38

(87) INFORMATION FOR SEQ ID NO:86:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 39 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:86:

CGGAATTCAT GTATTAAATC TAGATTCTGT CCAGGCCCG

39

(88) INFORMATION FOR SEQ ID NO:87:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 1101 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:87:

ATGTGGAACG CGACGCCAG CGAAGAGCCG GGGTTCAACC TCACACTGGC CGACCTGGAC 60
 TGGGATGCTT CCCCCGGCAA CGACTCGCTG GGCAGCAGAGC TGCTGCAGCT CTTCCTCCGCG 120
 CCGCTGCTGG CGGGCGTCCAG AGCCACCTGC GTGGCACTCT TCGTGGTGGG TATCGCTGGC 180
 AACCTGCTCA CCATGCTGGT GGTGTCGCGC TTCGCGAGC TGCGCACCAC CACCAACCTC 240
 5 TACCTGTCCA GCATGGCCTT CTCGATCTG CTCATCTTCC TCTGCATGCC CCTGGACCTC 300
 GTTCGCCTCT GGCAGTACCG GCCCTGGAAC TTCGGCGACC TCCTCTGCAA ACTCTTCCAA 360
 TTCGTCAGTG AGAGCTGCAC CTACGCCACG GTGCTCACCA TCACAGCGCT GAGCGTCGAG 420
 CGCTACTTCG CCATCTGCTT CCCACTCCGG GCCAAGGTGG TGGTCACCAA GGGGCGGGTG 480
 AAGCTGGTCA TCTTCGTCAT CTGGGCCGTG GCCTTCTGCA GCGCGGGGCG CATCTTCGTG 540
 10 TAGTCGGGG TGGAGCAGCA GAACGGCACC GACCCTTGGG ACACCAACGA GTGCGGCCCC 600
 ACCGAGTTTG CGGTGCGCTC TGGACTGCTC ACGGTCATGG TGTGGGTGTC CAGCATCTTC 660
 TTCTTCTTTC CTGTCTTCTG TCTCACGGTC CTCTACAGTC TCATCGGCAG GAAGCTGTGG 720
 CGGAGGAGGC GCGGCGATGC TGTCTGGGT GCCTCGCTCA GGGACCAGAA CCACAAGCAA 780
 ACCGTGAAAA TGCTGGCTGT AGTGGTGTTC GCCTTCATCC TCTGTGGCT CCCCTTCCAC 840
 15 TAGGGCGCAT ATTTATTTC CAAATCCTTT GAGCCTGGCT CCTTGGAGAT TGCTCAGATC 900
 AGCCAGTACT GCAACCTCGT GTCCTTTGTC CTCTTCTACC TCAGTGCTGC CATCAACCCC 960
 ATTCTGTACA ACATCATGTC CAAGAAGTAC CGGGTGGCAG TGTTTCAGACT TCTGGGATTC 1020
 GAACCCCTCT CCCAGAGAAA GCTCTCCACT CTGAAAGATG AAGTTCTCG GGCCTGGACA 1080
 GAATCTAGTA TTAATCATG A 1101

20 (89) INFORMATION FOR SEQ ID NO:88:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 366 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 25 (D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:88:

Met Trp Asn Ala Thr Pro Ser Glu Glu Pro Gly Phe Asn Leu Thr Leu
 1 5 10 15
 30 Ala Asp Leu Asp Trp Asp Ala Ser Pro Gly Asn Asp Ser Leu Gly Asp
 20 25 30

68

Glu Leu Leu Gln Leu Phe Pro Ala Pro Leu Leu Ala Gly Val Thr Ala
 35 40 45
 Thr Cys Val Ala Leu Phe Val Val Gly Ile Ala Gly Asn Leu Leu Thr
 50 55 60
 5 Met Leu Val Val Ser Arg Phe Arg Glu Leu Arg Thr Thr Thr Asn Leu
 65 70 75 80
 Tyr Leu Ser Ser Met Ala Phe Ser Asp Leu Leu Ile Phe Leu Cys Met
 85 90 95
 10 Pro Leu Asp Leu Val Arg Leu Trp Gln Tyr Arg Pro Trp Asn Phe Gly
 100 105 110
 Asp Leu Leu Cys Lys Leu Phe Gln Phe Val Ser Glu Ser Cys Thr Tyr
 115 120 125
 Ala Thr Val Leu Thr Ile Thr Ala Leu Ser Val Glu Arg Tyr Phe Ala
 130 135 140
 15 Ile Cys Phe Pro Leu Arg Ala Lys Val Val Val Thr Lys Gly Arg Val
 145 150 155 160
 Lys Leu Val Ile Phe Val Ile Trp Ala Val Ala Phe Cys Ser Ala Gly
 165 170 175
 20 Pro Ile Phe Val Leu Val Gly Val Glu His Glu Asn Gly Thr Asp Pro
 180 185 190
 Trp Asp Thr Asn Glu Cys Arg Pro Thr Glu Phe Ala Val Arg Ser Gly
 195 200 205
 Leu Leu Thr Val Met Val Trp Val Ser Ser Ile Phe Phe Leu Pro
 210 215 220
 25 Val Phe Cys Leu Thr Val Leu Tyr Ser Leu Ile Gly Arg Lys Leu Trp
 225 230 235 240
 Arg Arg Arg Arg Gly Asp Ala Val Val Gly Ala Ser Leu Arg Asp Gln
 245 250 255
 30 Asn His Lys Gln Thr Val Lys Met Leu Ala Val Val Val Phe Ala Phe
 260 265 270
 Ile Leu Cys Trp Leu Pro Phe His Val Gly Arg Tyr Leu Phe Ser Lys
 275 280 285
 Ser Phe Glu Pro Gly Ser Leu Glu Ile Ala Gln Ile Ser Gln Tyr Cys
 290 295 300
 35 Asn Leu Val Ser Phe Val Leu Phe Tyr Leu Ser Ala Ala Ile Asn Pro
 305 310 315 320
 Ile Leu Tyr Asn Ile Met Ser Lys Lys Tyr Arg Val Ala Val Phe Arg

325 330 335

Leu Leu Gly Phe Glu Pro Phe Ser Gln Arg Lys Leu Ser Thr Leu Lys
340 345 350

Asp Glu Ser Ser Arg Ala Trp Thr Glu Ser Ser Ile Asn Thr
355 360 365

(90) INFORMATION FOR SEQ ID NO:89:

(i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 33 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:89:

GCAAGCTTGT GCCCTCACCA AGCCATGCGA GCC 33

(91) INFORMATION FOR SEQ ID NO:90:

(i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 30 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:90:

CGGAATTCAG CAATGAGTTC CGACAGAAGC 30

(92) INFORMATION FOR SEQ ID NO:91:

(i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 1842 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:91:

ATGCGAGCCC CGGGCGCGCT TCTCGCCGCG ATGTCGCGCG TACTGCTTCT GCTACTGCTC 60
AAGGTGTCTG CCTCTTCTGC CCTCGGGGTC GCCCTTGCCT CCAGAAACGA AACTTGTCTG 120
GGGAGAGACT GTGCACCTAC AGTGATCCAG CGCCGCGGCA GGGACGCGTG GGGACCGGGA 180
AATTCTGCAA GAGACGTTCT GCGAGCCCGA GCACCCAGGG AGGAGCAGGG GGCAGCGTTT 240

	CTTGCGGGAC	CCTCCTGGGA	CCTGCCGGCG	GCCCCGGGCC	GTGACCCGGC	TGCAGGCAGA	300
	GGGCGGAGG	CGTCGGCAGC	CGGACCCCG	GGACCTCCAA	CCAGGCCACC	TGGCCCCCTGG	360
	AGGTGGAAAG	GTGCTCGGGG	TCAGGAGCCT	TCTGAAACTT	TGGGGAGAGG	GAACCCACG	420
	GCCCTCCAGC	TCTTCTTCA	GATCTCAGAG	GAGGAAGAGA	AGGGTCCCAG	AGCGCTGGC	480
5	ATTTCGGGG	GTAGCCAGGA	GCAGAGTGTG	AAGACAGTCC	CCGGAGCCAG	CGATCTTTTT	540
	TACTGGCCAA	GGAGAGCCGG	GAAACTCCAG	GGTTCACCAC	ACAAGCCCCT	GTCCAAGACG	600
	GCCAATGGAC	TGGCGGGGCA	CGAAGGTGG	ACAAATGCAC	TCCCGGGCCG	GGCGCTGGCC	660
	CAGAATGGAT	CCTTGGGTGA	AGGAATCCAT	GAGCCTGGGG	GTCCCCGCCG	GGGAAACAGC	720
	ACGAACCGCG	GTGTGAGACT	GAAGAACCCC	TTCTACCCGC	TGACCCAGGA	GTCTTATGGA	780
10	GCCTACGCGC	TCATGTGTCT	GTCCGTGGTG	ATCTTCGSGA	CCGGCATCAT	TGGCAACCTG	840
	GCGGTGATGA	GCATCGTGTG	CCACAACCTAC	TACATGCGGA	GCATCTCCAA	CTCCCTCTTG	900
	GCCAACCTGG	CCTTCTGGGA	CTTTCTCATC	ATCTTCTTCT	GCCTTCCGCT	GGTCATCTTC	960
	CACGAGCTGA	CCAAGAAGTG	GCTGCTGGAG	GACTTCTCCT	GCAAGATCGT	GCCCTATATA	1020
	GAGGTCGCTT	CTCTGGGAGT	CACCACTTTC	ACCTTATGTG	CTCTGTGCAT	AGACCGCTTC	1080
15	CGTGCTGCCA	CCAACGTACA	GATGTACTAC	GAAATGATCG	AAAACGTTC	CTCAACAACCT	1140
	GCCAAACTTG	CTGTATATG	GGTGGGAGCT	CTATTGTTAG	CACCTCCAGA	AGTTGTTCTC	1200
	CGCCAGCTGA	GCAAGGAGGA	TTTGGGGTTT	AGTGGCCGAG	CTCCGGCAGA	AAGGTGCATT	1260
	ATTAAGATCT	CTCCTGATTT	ACCAGACACC	ATCTATGTTC	TAGCCCTCAC	CTACGACAGT	1320
	GCGAGACTGT	GGTGGTATTT	TGGCTGTTAC	TTTTGTTTGC	CCACGCTTTT	CACCATCACC	1380
20	TGCTCTCTAG	TGACTGCGAG	GAAAATCCGC	AAAGCAGAGA	AAGCCTGTAC	CCGAGGGAAT	1440
	AAACGCGAGA	TTCAACTAGA	GAGTCAGATG	AACTGTACAG	TAGTGGCACT	GACCATTTTA	1500
	TATGGATTTT	GCATTATTCC	TGAAAATATC	TGCAACATTG	TTACTGCCTA	CATGGCTACA	1560
	GGGGTTTCAC	AGCAGACAAT	GGACCTCCTT	AATATCATCA	GCCAGTTCCT	TTTGTCTCTT	1620
	AAGTCTGTG	TCACCCCACT	CCTCCTTTTC	TGTCTCTGCA	AACCCCTTCAG	TCGGGCCTTC	1680
25	ATGGAGTGCT	GCTGCTGTTG	CTGTGAGGAA	TGCATTGAGA	AGTCTTCAAC	GGTGACCACT	1740
	GATGACAATG	ACAACGAGTA	CACCACGGAA	CTCGAATCT	CGCCTTTCAG	TACCATACGC	1800
	CGTGAAATGT	CCACTTTTGC	TTCTGTGCGA	ACTCAATTGCT	GA		1842

(93) INFORMATION FOR SEQ ID NO:92:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 613 amino acids

(B) TYPE: amino acid

(C) STRANDEDNESS:

(D) TOPCLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:92:

Met Arg Ala Pro Gly Ala Leu Leu Ala Arg Met Ser Arg Leu Leu Leu
 1 5 10 15
 Leu Leu Leu Leu Lys Val Ser Ala Ser Ser Ala Leu Gly Val Ala Pro
 20 25 30
 Ala Ser Arg Asn Glu Thr Cys Leu Gly Glu Ser Cys Ala Pro Thr Val
 35 40 45
 Ile Gln Arg Arg Gly Arg Asp Ala Trp Gly Pro Gly Asn Ser Ala Arg
 50 55 60
 Asp Val Leu Arg Ala Arg Ala Pro Arg Glu Glu Gln Gly Ala Ala Phe
 65 70 75 80
 Leu Ala Gly Pro Ser Trp Asp Leu Pro Ala Ala Pro Gly Arg Asp Pro
 85 90 95
 Ala Ala Gly Arg Gly Ala Glu Ala Ser Ala Ala Gly Pro Pro Gly Pro
 100 105 110
 Pro Thr Arg Pro Pro Gly Pro Trp Arg Trp Lys Gly Ala Arg Gly Gln
 115 120 125
 Glu Pro Ser Glu Thr Leu Gly Arg Gly Asn Pro Thr Ala Leu Gln Leu
 130 135 140
 Phe Leu Gln Ile Ser Glu Glu Glu Glu Lys Gly Pro Arg Gly Ala Gly
 145 150 155 160
 Ile Ser Gly Arg Ser Gln Glu Gln Ser Val Lys Thr Val Pro Gly Ala
 165 170 175
 Ser Asp Leu Phe Tyr Trp Pro Arg Arg Ala Gly Lys Leu Gln Gly Ser
 180 185 190
 His His Lys Pro Leu Ser Lys Thr Ala Asn Gly Leu Ala Gly His Glu
 195 200 205
 Gly Trp Thr Ile Ala Leu Pro Gly Arg Ala Leu Ala Gln Asn Gly Ser
 210 215 220
 Leu Gly Glu Gly Ile His Glu Pro Gly Gly Pro Arg Arg Gly Asn Ser
 225 230 235 240

Thr Asn Arg Arg Val Arg Leu Lys Asn Pro Phe Tyr Pro Leu Thr Gln
 245 250 255
 Glu Ser Tyr Gly Ala Tyr Ala Val Met Cys Leu Ser Val Val Ile Phe
 260 265 270
 5 Gly Thr Gly Ile Ile Gly Asn Leu Ala Val Met Ser Ile Val Cys His
 275 280 285
 Asn Tyr Tyr Met Arg Ser Ile Ser Asn Ser Leu Leu Ala Asn Leu Ala
 290 295 300
 10 Phe Trp Asp Phe Leu Ile Ile Phe Phe Cys Leu Pro Leu Val Ile Phe
 305 310 315 320
 His Glu Leu Thr Lys Lys Trp Leu Leu Glu Asp Phe Ser Cys Lys Ile
 325 330 335
 Val Pro Tyr Ile Glu Val Ala Ser Leu Gly Val Thr Thr Phe Thr Leu
 340 345 350
 15 Cys Ala Leu Cys Ile Asp Arg Phe Arg Ala Ala Thr Asn Val Gln Met
 355 360 365
 Tyr Tyr Glu Met Ile Glu Asn Cys Ser Ser Thr Thr Ala Lys Leu Ala
 370 375 380
 20 Val Ile Trp Val Gly Ala Leu Leu Leu Ala Leu Pro Glu Val Val Leu
 385 390 395 400
 Arg Gln Leu Ser Lys Glu Asp Leu Gly Phe Ser Gly Arg Ala Pro Ala
 405 410 415
 Glu Arg Cys Ile Ile Lys Ile Ser Pro Asp Leu Pro Asp Thr Ile Tyr
 420 425 430
 25 Val Leu Ala Leu Thr Tyr Asp Ser Ala Arg Leu Trp Trp Tyr Phe Gly
 435 440 445
 Cys Tyr Phe Cys Leu Pro Thr Leu Phe Thr Ile Thr Cys Ser Leu Val
 450 455 460
 30 Thr Ala Arg Lys Ile Arg Lys Ala Glu Lys Ala Cys Thr Arg Gly Asn
 465 470 475 480
 Lys Arg Gln Ile Gln Leu Glu Ser Gln Met Asn Cys Thr Val Val Ala
 485 490 495
 Leu Thr Ile Leu Tyr Gly Phe Cys Ile Ile Pro Glu Asn Ile Cys Asn
 500 505 510
 35 Ile Val Thr Ala Tyr Met Ala Thr Gly Val Ser Gln Gln Thr Met Asp
 515 520 525
 Leu Leu Asn Ile Ile Ser Gln Phe Leu Leu Phe Phe Lys Ser Cys Val

530 535 540

Thr Pro Val Leu Leu Phe Cys Leu Cys Lys Pro Phe Ser Arg Ala Phe
545 550 555 560

5 Met Glu Cys Cys Cys Cys Cys Cys Glu Glu Cys Ile Gln Lys Ser Ser
565 570 575

Thr Val Thr Ser Asp Asp Asn Asp Asn Glu Tyr Thr Thr Glu Leu Glu
580 585 590

Leu Ser Pro Phe Ser Thr Ile Arg Arg Glu Met Ser Thr Phe Ala Ser
595 600 605

10 Val Gly Thr His Cys
610

(94) INFORMATION FOR SEQ ID NO:93:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 34 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:93:

20 CAGAATTCAG AGAAAAAAG TGAATATGGT TTTT 34

(95) INFORMATION FOR SEQ ID NO:94:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 32 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:94:

TTGGATCCCT GGTGCATAAC AATGAAAGA AT 32

30 (96) INFORMATION FOR SEQ ID NO:95:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 1248 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:95:

	ATGTTT	CTCACAGAAT	GGATAACAGC	AAGCCACATT	TGATTATTCC	TACACTTCTG	60
	GTGCCCCCTCC	AAAACCGCAG	CTGCACTGAA	ACAGCCACAC	CTCTGCCAAG	CCAATACCTG	120
	ATGGAATTAA	GTGAGGAGCA	CAGTTGGATG	AGCAACCAAA	CAGACCTTCA	CTATGTGCTG	180
5	AAACCCGGGG	AAGTGGCCAC	AGCCAGCATC	TTCTTTGGGA	TTCTGTGGTT	GTTTTCTATC	240
	TTCCGCAATT	CCCTGGTTTG	TTTGTTCATC	CATAGGAGTA	GGAGGACTCA	GTCTACCACC	300
	AACTACTTTG	TGGTCTCCAT	GGCATGTGCT	GACCTTCTCA	TCAGCGTTGC	CAGCACGCCT	360
	TTCTCTCTGC	TCCAGTTCAC	CACTGGAAGG	TGGACGCTGG	GTAGTGCAAC	GTGCAAGGTT	420
	GTGCGATATT	TTCAATATCT	CACTCCAGGT	GTCCAGATCT	ACGTTCTCCT	CTCCATCTGC	480
10	ATAGACCGGT	TCTACACCAT	CGTCTATCCT	CTGAGCTTCA	AGGTGTCCAG	AGAAAAAGCC	540
	AAGAAAATGA	TTGCGGCATC	GTGGATCTTT	GATGCAGGCT	TTGTGACCCC	TGTGCTCTTT	600
	TTCTATGGCT	CCAACCTGGA	CAGTCATTGT	AACTATTTC	TCCCCTCCTC	TTGGGAAGGC	660
	ACTGCCTACA	CTGTCACTCA	CTTCTTGGTG	GGCTTTGTGA	TTCCATCTGT	CCTCATAATT	720
	TTATTTTACC	AAAAGGTCAT	AAAATATATT	TGGAGAATAG	GCACAGATGG	CCGAACGGTG	780
15	AGGAGGACAA	TGAACATTGT	CCCTCGGACA	AAAGTGAAAA	CTATCAAGAT	GTTCCTCATT	840
	TTAAATCTGT	TGTTTTTGCT	CTCCTGGCTG	CCTTTTCATG	TAGCTCAGCT	ATGGCACCCC	900
	CATGAACAAG	ACTATAAGAA	AAGTTCCTCT	GTTTTCACAG	CTATCACATG	GATATCCTTT	960
	AGTTCCTCAG	CCTCTAAACC	TACTCTGTAT	TCAATTTATA	ATGCCAATT	TCGGAGAGGG	1020
	ATGAAAGAGA	CTTTTGTGAT	GTCTCTATG	AAATGTTACC	GAAGCAATGC	CTATACTATC	1080
20	ACAACAAGTT	CAAGGATGGC	CAAAAAAAC	TACGTTGGCA	TTTCAGAAAT	CCCTTCCATG	1140
	GCCAAACTA	TTACCAAGA	CTCGATCTAT	GACTCATTG	ACAGAGAAGC	CAAGGAAAAA	1200
	AAGCTTGCTT	GGCCCAATAA	CTCAATCCA	CCAAATACTT	TGTCTTAA		1248

(97) INFORMATION FOR SEQ ID NO:96:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 415 amino acids
 - (B) TYPE: amino acid
 - (C) STRANDEDNESS:
 - (D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:96:

Met Val Phe Ala His Arg Met Asp Asn Ser Lys Pro His Leu Ile Ile
 1 5 10 15
 Pro Thr Leu Leu Val Pro Leu Gln Asn Arg Ser Cys Thr Glu Thr Ala
 20 25 30
 5 Thr Pro Leu Pro Ser Gln Tyr Leu Met Glu Leu Ser Glu Glu His Ser
 35 40 45
 Trp Met Ser Asn Gln Thr Asp Leu His Tyr Val Leu Lys Pro Gly Glu
 50 55 60
 10 Val Ala Thr Ala Ser Ile Phe Phe Gly Ile Leu Trp Leu Phe Ser Ile
 65 70 75 80
 Phe Gly Asn Ser Leu Val Cys Leu Val Ile His Arg Ser Arg Arg Thr
 85 90 95
 Gln Ser Thr Thr Asn Tyr Phe Val Val Ser Met Ala Cys Ala Asp Leu
 100 105 110
 15 Leu Ile Ser Val Ala Ser Thr Pro Phe Val Leu Leu Gln Phe Thr Thr
 115 120 125
 Gly Arg Trp Thr Leu Gly Ser Ala Thr Cys Lys Val Val Arg Tyr Phe
 130 135 140
 20 Gln Tyr Leu Thr Pro Gly Val Gln Ile Tyr Val Leu Leu Ser Ile Cys
 145 150 155 160
 Ile Asp Arg Phe Tyr Thr Ile Val Tyr Pro Leu Ser Phe Lys Val Ser
 165 170 175
 Arg Glu Lys Ala Lys Lys Met Ile Ala Ala Ser Trp Ile Phe Asp Ala
 180 185 190
 25 Gly Phe Val Thr Pro Val Leu Phe Phe Tyr Gly Ser Asn Trp Asp Ser
 195 200 205
 His Cys Asn Tyr Phe Leu Pro Ser Ser Trp Glu Gly Thr Ala Tyr Thr
 210 215 220
 30 Val Ile His Phe Leu Val Gly Phe Val Ile Pro Ser Val Leu Ile Ile
 225 230 235 240
 Leu Phe Tyr Gln Lys Val Ile Lys Tyr Ile Trp Arg Ile Gly Thr Asp
 245 250 255
 Gly Arg Thr Val Arg Arg Thr Met Asn Ile Val Pro Arg Thr Lys Val
 260 265 270
 35 Lys Thr Ile Lys Met Phe Leu Ile Leu Asn Leu Leu Phe Leu Leu Ser
 275 280 285

76

Trp Leu Pro Phe His Val Ala Gln Leu Trp His Pro His Glu Gln Asp
 290 295 300

Tyr Lys Lys Ser Ser Leu Val Phe Thr Ala Ile Thr Trp Ile Ser Phe
 305 310 315 320

5 Ser Ser Ser Ala Ser Lys Pro Thr Leu Tyr Ser Ile Tyr Asn Ala Asn
 325 330 335

Phe Arg Arg Gly Met Lys Glu Thr Phe Cys Met Ser Ser Met Lys Cys
 340 345 350

10 Tyr Arg Ser Asn Ala Tyr Thr Ile Thr Thr Ser Ser Arg Met Ala Lys
 355 360 365

Lys Asn Tyr Val Gly Ile Ser Glu Ile Pro Ser Met Ala Lys Thr Ile
 370 375 380

Thr Lys Asp Ser Ile Tyr Asp Ser Phe Asp Arg Glu Ala Lys Glu Lys
 385 390 395 400

15 Lys Leu Ala Trp Pro Ile Asn Ser Asn Pro Pro Asn Thr Phe Val
 405 410 415

(98) INFORMATION FOR SEQ ID NO:97:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 30 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:97:

25 GGAAAGCTTA ACGATCCCCA GGAGCAACAT

30

(99) INFORMATION FOR SEQ ID NO:98:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 31 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:98:

CTGGGATCCT ACGAGAGCAT TTTTCACACA G

31

35 (100) INFORMATION FOR SEQ ID NO:99:

- (i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 1842 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

5 (ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:99:

	ATGGGGCCCA	CCCTAGCGGT	TCCCACCCCC	TATGGCTGTA	TTGGCTGTAA	GCTACCCAG	60
	CCAGAATACC	CACCGCTCT	AATCATCTTT	ATGTTCTGCG	CGATGGTTAT	CACCATCGTT	120
	GTAGACCTAA	TCGCAACTC	CATGGTCATT	TTGGCTGTGA	CGAAGAACAA	GAAGTCCGG	180
10	AATTCTGGCA	ACATCTTCGT	GGTCAGTCTC	TCTGTGGCCG	ATATGCTGGT	GGCCATCTAC	240
	CCATACCCTT	TGATGTGCA	TGCCATGTCC	ATTGGGGGCT	GGGATCTGAG	CCAGTTACAG	300
	TGCCAGATGG	TCGGGTTTCT	CACAGGGCTG	AGTGTGGTCG	GCTCCATCTT	CAACATCGTG	360
	GCAATCGCTA	TCAACCGTTA	CTGCTACATC	TGCCACAGCC	TCCAGTACGA	ACGGATCTTC	420
	AGTGTGCACA	ATACCTGCAT	CTACCTGGTC	ATCACCTGGA	TCATGACCGT	CCTGGCTGTC	480
15	CTGCCCAACA	TGTACATTGG	CACCATCGAG	TACGATCCTC	GCACCTACAC	CTGCATCTTC	540
	AACTATCTGA	ACAACCTGT	CTTCACTGTT	ACCATCGTCT	GCATCCACTT	CGTCTCCCT	600
	CTCCTCATCG	TGGGTTTCTG	CTACGTGAGG	ATCTGGACCA	AAGTGCTGGC	GGCCCGTGAC	660
	CCTGCAGGGC	AGAATCCTGA	CAACCAACTT	GCTGAGGTTC	GCAATTTTCT	AACCATGTTT	720
	GTGATCTTCC	TCCTCTTTGC	AGTGTGCTGG	TGCCCTATCA	ACGTGCTCAC	TGTCTTGGTG	780
20	GCTGTCAGTC	CGAAGGAGAT	GGCAGGCAAG	ATCCCCAACT	GGCTTTATCT	TGCAGCCTAC	840
	TTCATAGCCT	ACTTCAACAG	CTGCCTCAAC	GCTGTGATCT	ACGGGCTCCT	CAATGAGAAT	900
	TTCCGAAGAG	AATACTGGAC	CATCTTCCAT	GCTATGCGGC	ACCCTATCAT	ATTCTTCCCT	960
	GGCCTCATCA	GTGATATTCG	TGAGATGCAG	GAGGCCCGTA	CCCTGGCCCG	CGCCCGTGCC	1020
	CATGCTCGCG	ACCAAGCTCG	TGAACAAGAC	CGTGCCCATG	CCTGTCTCTG	TGTGGAGGAA	1080
25	ACCCCGATGA	ATGTCCGGAA	TGTTCCATTA	CCTGGTGAIG	CTGCAGCTGG	CCACCCCGAC	1140
	CGTGCTCTG	GCCACCTAA	GCCCCATTCC	AGATCTCTCT	CTGCCTATCG	CAAATCTGCC	1200
	TCTACCCACC	ACAAGTCTGT	CTTTAGCCAC	TOCAAGGCTG	CCTCTGGTCA	CCTCAAGCCT	1260
	GTCTCTGGCC	ACTCCAAGCC	TGCCTCTGGT	CACCCCAAGT	CTGCCACTGT	CTACCCTAAG	1320
	CCTGCCTCTG	TCCATTTCAA	GGGTGACTCT	GTCCATTTC	AGGGTGACTC	TGTCCATTTC	1380

	AAGCCTGACT	CTGTTTCATT	CAAGCCTGCT	TCCAGCAACC	CCAAGCCCAT	CACTGGCCAC	1440
	CATGTCCTG	CTGGCAGCCA	TCCTCAAGTCT	GCCTTCAGTG	CTGCCACCAG	CCACCCATAA	1500
	CCCATCAAGC	CAGCTACCAG	CCATGCTGAG	CCCACCACTG	CTGACTATCC	CAAGCCTGCC	1560
	ACTACCAGCC	ACCCTAAGCC	CGCTGCTGCT	GACAACCCCTG	AGCTCTCTGC	CTCCCATATG	1620
5	CCCGAGATCC	CTGCCATTGC	CCACCCCTGTG	TCTGACGACA	GTGACCTCCC	TGAGTCGGCC	1680
	TCTAGCCCTG	CCGCTGGGCC	CACCAAGCCT	GCTGCCAGCC	AGCTGGAGTC	TGACACCATC	1740
	GCTGACCTTC	CTGACCCTAC	TGTAGTCACT	ACCAAGTACCA	ATGATTACCA	TGATGTCGTG	1800
	GTTGTTGATG	TTGAAGATGA	TCCTGATGAA	ATGGCTGTGT	GA		1842

(101) INFORMATION FOR SEQ ID NO:100:

- 10 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 613 amino acids
(B) TYPE: amino acid
(C) STRANDEDNESS:
(D) TOPOLOGY: not relevant

- 15 (ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:100:

	Met	Gly	Pro	Thr	Leu	Ala	Val	Pro	Thr	Pro	Tyr	Gly	Cys	Ile	Gly	Cys
	1				5					10					15	
20	Lys	Leu	Pro	Gln	Pro	Glu	Tyr	Pro	Pro	Ala	Leu	Ile	Ile	Phe	Met	Phe
				20					25					30		
	Cys	Ala	Met	Val	Ile	Thr	Ile	Val	Val	Asp	Leu	Ile	Gly	Asn	Ser	Met
			35					40					45			
	Val	Ile	Leu	Ala	Val	Thr	Lys	Asn	Lys	Lys	Leu	Arg	Asn	Ser	Gly	Asn
			50					55				60				
25	Ile	Phe	Val	Val	Ser	Leu	Ser	Val	Ala	Asp	Met	Leu	Val	Ala	Ile	Tyr
	65					70					75				80	
	Pro	Tyr	Pro	Leu	Met	Leu	His	Ala	Met	Ser	Ile	Gly	Gly	Trp	Asp	Leu
					85					90					95	
	Ser	Gln	Leu	Gln	Cys	Gln	Met	Val	Gly	Phe	Ile	Thr	Gly	Leu	Ser	Val
30				100					105					110		
	Val	Gly	Ser	Ile	Phe	Asn	Ile	Val	Ala	Ile	Ala	Ile	Asn	Arg	Tyr	Cys
			115					120					125			
	Tyr	Ile	Cys	His	Ser	Leu	Gln	Tyr	Glu	Arg	Ile	Phe	Ser	Val	Arg	Asn
		130					135					140				

	Thr	Cys	Ile	Tyr	Leu	Val	Ile	Thr	Trp	Ile	Met	Thr	Val	Leu	Ala	Val
	145					150					155					160
	Leu	Pro	Asn	Met	Tyr	Ile	Gly	Thr	Ile	Glu	Tyr	Asp	Pro	Arg	Thr	Tyr
				165						170					175	
5	Thr	Cys	Ile	Phe	Asn	Tyr	Leu	Asn	Asn	Pro	Val	Phe	Thr	Val	Thr	Ile
				180					185					190		
	Val	Cys	Ile	His	Phe	Val	Leu	Pro	Leu	Leu	Ile	Val	Gly	Phe	Cys	Tyr
		195						200					205			
10	Val	Arg	Ile	Trp	Thr	Lys	Val	Leu	Ala	Ala	Arg	Asp	Pro	Ala	Gly	Gln
	210						215						220			
	Asn	Pro	Asp	Asn	Gln	Leu	Ala	Glu	Val	Arg	Asn	Phe	Leu	Thr	Met	Phe
	225					230					235					240
	Val	Ile	Phe	Leu	Leu	Phe	Ala	Val	Cys	Trp	Cys	Pro	Ile	Asn	Val	Leu
				245						250					255	
15	Thr	Val	Leu	Val	Ala	Val	Ser	Pro	Lys	Glu	Met	Ala	Gly	Lys	Ile	Pro
			260						265					270		
	Asn	Trp	Leu	Tyr	Leu	Ala	Ala	Tyr	Phe	Ile	Ala	Tyr	Phe	Asn	Ser	Cys
			275					280						285		
20	Leu	Asn	Ala	Val	Ile	Tyr	Gly	Leu	Leu	Asn	Glu	Asn	Phe	Arg	Arg	Glu
	290						295					300				
	Tyr	Trp	Thr	Ile	Phe	His	Ala	Met	Arg	His	Pro	Ile	Ile	Phe	Phe	Pro
	305					310					315					320
	Gly	Leu	Ile	Ser	Asp	Ile	Arg	Glu	Met	Gln	Glu	Ala	Arg	Thr	Leu	Ala
				325						330					335	
25	Arg	Ala	Arg	Ala	His	Ala	Arg	Asp	Gln	Ala	Arg	Glu	Gln	Asp	Arg	Ala
				340					345					350		
	His	Ala	Cys	Pro	Ala	Val	Glu	Glu	Thr	Pro	Met	Asn	Val	Arg	Asn	Val
		355						360						365		
30	Pro	Leu	Pro	Gly	Asp	Ala	Ala	Ala	Gly	His	Pro	Asp	Arg	Ala	Ser	Gly
	370						375					380				
	His	Pro	Lys	Pro	His	Ser	Arg	Ser	Ser	Ser	Ala	Tyr	Arg	Lys	Ser	Ala
	385					390					395					400
	Ser	Thr	His	His	Lys	Ser	Val	Phe	Ser	His	Ser	Lys	Ala	Ala	Ser	Gly
				405						410					415	
35	His	Leu	Lys	Pro	Val	Ser	Gly	His	Ser	Lys	Pro	Ala	Ser	Gly	His	Pro
			420						425					430		
	Lys	Ser	Ala	Thr	Val	Tyr	Pro	Lys	Pro	Ala	Ser	Val	His	Phe	Lys	Gly

80

	435	440	445
	Asp Ser Val His Phe Lys Gly Asp Ser Val His Phe Lys Pro Asp Ser		
	450	455	460
5	Val His Phe Lys Pro Ala Ser Ser Asn Pro Lys Pro Ile Thr Gly His		
	465	470	475
	His Val Ser Ala Gly Ser His Ser Lys Ser Ala Phe Ser Ala Ala Thr		
		485	490
			495
	Ser His Pro Lys Pro Ile Lys Pro Ala Thr Ser His Ala Glu Pro Thr		
		500	505
			510
10	Thr Ala Asp Tyr Pro Lys Pro Ala Thr Thr Ser His Pro Lys Pro Ala		
		515	520
			525
	Ala Ala Asp Asn Pro Glu Leu Ser Ala Ser His Cys Pro Glu Ile Pro		
		530	535
			540
15	Ala Ile Ala His Pro Val Ser Asp Asp Ser Asp Leu Pro Glu Ser Ala		
		545	550
			555
			560
	Ser Ser Pro Ala Ala Gly Pro Thr Lys Pro Ala Ala Ser Gln Leu Glu		
		565	570
			575
	Ser Asp Thr Ile Ala Asp Leu Pro Asp Pro Thr Val Val Thr Thr Ser		
		580	585
			590
20	Thr Asn Asp Tyr His Asp Val Val Val Val Asp Val Glu Asp Asp Pro		
		595	600
			605
	Asp Glu Met Ala Val		
		610	

(102) INFORMATION FOR SEQ ID NO:101:

- 25 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 32 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- 30 (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:101:

TCCAAGCTTC GCCATGGGAC ATAACGGGAG CT

32

(103) INFORMATION FOR SEQ ID NO:102:

- 35 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 30 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:102:

CGTGAATTCC AAGAATTAC AATCCTTGCT

30

5 (104) INFORMATION FOR SEQ ID NO:103:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 1548 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

10 (ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:103:

ATGGGACATA ACGGAGCTG GATCTCTCCA AATGCCAGCG AGCGGCACAA CGCGTCCGGC 60

GCCGAGGCTG CGGGTGTGAA CCGCAGCGCG CTCGGGGAGT TCGGCGAGGC GCAGCTGTAC 120

15 CGCCAGTTCA CCACCACCGT GCAGGTCGTC ATCTTCATAG GCTCGTGCT CCGAAACTTC 180

ATGGTGTTAT GGTCAACTTG CCGCACACC GTGTTCAAAT CTGTACCAA CAGGTTTATT 240

AAAAACCTGG CCTGCTCGGG GATTGTGCC AGCCTGCTCT GTGTGCCCTT CGACATCATC 300

CTCAGACCA GTCCCTACTG TTGCTGGTGG ATCTACACCA TGCTCTTCTG CAAGGTGCTC 360

AAATTTTTCG ACAAAGTATT CTGCTCTGTG ACCATCCTCA GCTTCCTGCG TATTGCTTTG 420

20 GACAGGTACT ACTCAGTCTC CTATCCACTG GAGAGGAAAA TATCTGATGC CAAGTCCCGT 480

GAACTGGTGA TGTACATCTG GGCCCATGCA GTGGTGGCCA GTGTCCCTGT GTTTGCAGTA 540

ACCAATGTGG CTGACATCTA TGCCACGTCC ACCTGCACGG AAGTCTGGAG CAACTCCTTG 600

GGCCACCTGG TGTACGTTCT GGTGTATAAC ATCACCACGG TCATTGTGCC TGTGGTGGTG 660

GTGTTCTCTT TCTTGATACT GATCCGACGG GCCCTGAGTG CCAGCCAGAA GAAGAAGGTC 720

25 ATCATAGCAG CGCTCCGAC CCCACAGAAC ACCATCTCTA TTCCCTATGC CTCCAGCGG 780

GAGGCCGAGC TGCACGCCAC CCTGCTCTCC ATGGTGTATG TCTTCATCTT GTGTAGCGTG 840

CCCTATGCCA CCGTGGTCGT CTACCAGACT GTGCTCAATG TCCCTGACAC TTCCGCTTTC 900

TTGTGCTCA CTGCTGTTTG GCTGCCCAA GTCTCCCTGC TGGCAAAACC TGTTCTCTTT 960

CTTACTGTGA ACAAATCTGT CCGCAAGTGC TTGATAGGGA CCCTGGTGCA ACTACACCAC 1020

30 CGGTACAGTC GCCGTAATGT GGTCAGTACA GGGAGTGGCA TGGCTGAGGC CAGCCTGGAA 1080

CCCAGCATAC GCTCGGGTAG CCAGCTCCTG GAGATGTTCC ACATTGGGCA GCAGCAGATC 1140
 TTTAAGCCCA CAGAGGATGA GGAAGAGAGT GAGGCCAAGT ACATTGGGCTC AGTGACTTTC 1200
 CAGGCCAAGG AGATATTTAG CACCTGCCTC GAGGGAGAGC AGGGGCCACA GTTTGCGCCC 1260
 TCTGCCCCAC CCCTGAGCAC AGTGGACTCT GTATCCCAGG TGGCACCGGC AGCCCCGTGTG 1320
 5 GAACCTGAAA CATTCCCTGA TAAGTATTC CAGCAGTTTG GCTTTGGGCC TTTTGAGTTG 1380
 CCTCTCAGT GGCTCTCAGA GACCCGAAAC AGCAAGAAGC GGCTGCTTCC CCCCTTGGGC 1440
 AACACCCCAAG AAGAGCTGAT CCAGACAAAG GTGCCCAAGG TAGGCAGGGT GSAGCGGAAG 1500
 ATGAGCAGAA ACAATAAAGT GAGCATTTTT CCAAAGGTGG ATTCTCTAG 1548

(105) INFORMATION FOR SEQ ID NO:104:

- 10 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 515 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

- 15 (ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:104:

Met	Gly	His	Asn	Gly	Ser	Trp	Ile	Ser	Pro	Asn	Ala	Ser	Glu	Pro	His	1	5	10	15
Asn	Ala	Ser	Gly	Ala	Glu	Ala	Ala	Gly	Val	Asn	Arg	Ser	Ala	Leu	Gly	20	25	30	
Glu	Phe	Gly	Glu	Ala	Gln	Leu	Tyr	Arg	Gln	Phe	Thr	Thr	Thr	Val	Gln	35	40	45	
Val	Val	Ile	Phe	Ile	Gly	Ser	Leu	Leu	Gly	Asn	Phe	Met	Val	Leu	Trp	50	55	60	
Ser	Thr	Cys	Arg	Thr	Thr	Val	Phe	Lys	Ser	Val	Thr	Asn	Arg	Phe	Ile	65	70	75	80
Lys	Asn	Leu	Ala	Cys	Ser	Gly	Ile	Cys	Ala	Ser	Leu	Val	Cys	Val	Pro	85	90	95	
Phe	Asp	Ile	Ile	Leu	Ser	Thr	Ser	Pro	His	Cys	Cys	Trp	Trp	Ile	Tyr	100	105	110	
Thr	Met	Leu	Phe	Cys	Lys	Val	Val	Lys	Phe	Leu	His	Lys	Val	Phe	Cys	115	120	125	
Ser	Val	Thr	Ile	Leu	Ser	Phe	Pro	Ala	Ile	Ala	Leu	Asp	Arg	Tyr	Tyr	130	135	140	

83

Ser Val Leu Tyr Pro Leu Glu Arg Lys Ile Ser Asp Ala Lys Ser Arg
 145 150 155 160
 Glu Leu Val Met Tyr Ile Trp Ala His Ala Val Val Ala Ser Val Pro
 165 170 175
 5 Val Phe Ala Val Thr Asn Val Ala Asp Ile Tyr Ala Thr Ser Thr Cys
 180 185 190
 Thr Glu Val Trp Ser Asn Ser Leu Gly His Leu Val Tyr Val Leu Val
 195 200 205
 10 Tyr Asn Ile Thr Thr Val Ile Val Pro Val Val Val Val Phe Leu Phe
 210 215 220
 Leu Ile Leu Ile Arg Arg Ala Leu Ser Ala Ser Gln Lys Lys Lys Val
 225 230 235 240
 Ile Ile Ala Ala Leu Arg Thr Pro Gln Asn Thr Ile Ser Ile Pro Tyr
 245 250 255
 15 Ala Ser Gln Arg Glu Ala Glu Leu His Ala Thr Leu Leu Ser Met Val
 260 265 270
 Met Val Phe Ile Leu Cys Ser Val Pro Tyr Ala Thr Leu Val Val Tyr
 275 280 285
 20 Gln Thr Val Leu Asn Val Pro Asp Thr Ser Val Phe Leu Leu Leu Thr
 290 295 300
 Ala Val Trp Leu Pro Lys Val Ser Leu Leu Ala Asn Pro Val Leu Phe
 305 310 315 320
 Leu Thr Val Asn Lys Ser Val Arg Lys Cys Leu Ile Gly Thr Leu Val
 325 330 335
 25 Gln Leu His His Arg Tyr Ser Arg Arg Asn Val Val Ser Thr Gly Ser
 340 345 350
 Gly Met Ala Glu Ala Ser Leu Glu Pro Ser Ile Arg Ser Gly Ser Gln
 355 360 365
 30 Leu Leu Glu Met Phe His Ile Gly Gln Gln Gln Ile Phe Lys Pro Thr
 370 375 380
 Glu Asp Glu Glu Glu Ser Glu Ala Lys Tyr Ile Gly Ser Ala Asp Phe
 385 390 395 400
 Gln Ala Lys Glu Ile Phe Ser Thr Cys Leu Glu Gly Glu Gln Gly Pro
 405 410 415
 35 Gln Phe Ala Pro Ser Ala Pro Pro Leu Ser Thr Val Asp Ser Val Ser
 420 425 430
 Gln Val Ala Pro Ala Ala Pro Val Glu Pro Glu Thr Phe Pro Asp Lys

435 440 445

Tyr Ser Leu Gln Phe Gly Phe Gly Pro Phe Glu Leu Pro Pro Gln Trp
450 455 460

5 Leu Ser Glu Thr Arg Asn Ser Lys Lys Arg Leu Leu Pro Pro Leu Gly
465 470 475 480

Asn Thr Pro Glu Glu Leu Ile Gln Thr Lys Val Pro Lys Val Gly Arg
485 490 495

Val Glu Arg Lys Met Ser Arg Asn Asn Lys Val Ser Ile Phe Pro Lys
500 505 510

10 Val Asp Ser
515

(106) INFORMATION FOR SEQ ID NO:105:

(i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 29 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:105:

20 GGAGAATTCA CTAGGCGAGG CGCTCCATC 29

(107) INFORMATION FOR SEQ ID NO:106:

(i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 30 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:106:

25 GGAGGATCCA GGAAACCTTA GGCCGAGTCC 30

(108) INFORMATION FOR SEQ ID NO:107:

(i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 1164 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:107:

	ATGAATCGGC ACCATCTGCA GGATCACTTT CTGAAATAG ACAAGAAGAA CTGCTGTGTG	60
	TTCCGAGATG ACTTCATTGC CAAGGTGTG CCGCCGGTGT TGGGGCTGGA GTTTATCTTT	120
	GGGCTTCTGG GCAATGGCCT TGCCTGTGG ATTTTCTGTT TCCACCTCAA GTCTGGAAA	180
5	TCCAGCCGGA TTTTCTGTG CAACCTGGCA GTAGCTGACT TTCTACTGAT CATCTGCCTG	240
	CCGTCGTGA TGGACTACTA TGTGCGGCGT TCAGACTGGA ACTTTGGGGA CATCCCTTGC	300
	CGGCTGGTG TCTTCATGTT TGCCATGAAC CGCCAGGCA GCATCATCTT CCTCACGGTG	360
	GTGGCGGTAG ACAGGTATTT CCGGTGGTGC CATCCCCACC ACGCCCTGAA CAAGATCTCC	420
	AATTGGACAG CAGCCATCAT CTCTTGCCTT CTGTGGGGCA TCACTGTTGG CCTAACAGTC	480
10	CACCTCCTGA AGAAGAAGTT GCTGATCCAG AATGSCCTG CAAATGTGTG CATCAGCTTC	540
	AGCATCTGCC ATACCTTCCG GTGGCAGCAA GCTATGTTCC TCCTGGAGTT CCTCTGCC	600
	CTGGGCATCA TCCTGTCTG CTCAGCCAGA ATTATCTGGA GCCTGCGGCA GAGACAAATG	660
	GACCGGCATG CCAAGATCAA GAGAGCCATC ACCCTTCATCA TGTGGTGGC CATCGTCTTT	720
	GTCATCTGCT TCCTTCCCG CGTGGTTGTG CGGATCCGCA TCTTCTGGCT CCTGCACACT	780
15	TCGGGACGCG AGAATTGTGA AGTGACCGC TCGGTGGACC TGGCGTCTT TATCACTCTC	840
	AGCTTCACTT ACATGAACAG CATGCTGGAC CCCGTGGTGT ACTACTTCTC CAGCCCATCC	900
	TTTCCCAACT TCTTCTCCAC TTTGATCAAC CGCTGCCTCC AGAGGAAGAT GACAGGTGAG	960
	CCAGATAATA ACCGAGCAC GAGCGTCGAG CTCACAGGGG ACCCAACAA AACAGAGGC	1020
	GCTCCAGAGG CGTTAATGGC CAACTCCGGT GAGCCATGGA GCCCTCTTA TCTGGGCCCA	1080
20	ACCTCAATA ACCATTCCAA GAAGGGACAT TGTACCAAG AACCAGCATC TCTGGAGAAA	1140
	CAGTTGGGCT GTTGCATCGA GTAA	1164

(109) INFORMATION FOR SEQ ID NO:108:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 387 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:108:

30 Met Asn Arg His His Leu Gln Asp His Phe Leu Glu Ile Asp Lys Lys

	1	5	10	15
	Asn Cys Cys Val Phe Arg Asp Asp Phe Ile Ala Lys Val Leu Pro Pro	20	25	30
5	Val Leu Gly Leu Glu Phe Ile Phe Gly Leu Leu Gly Asn Gly Leu Ala	35	40	45
	Leu Trp Ile Phe Cys Phe His Leu Lys Ser Trp Lys Ser Ser Arg Ile	50	55	60
	Phe Leu Phe Asn Leu Ala Val Ala Asp Phe Leu Leu Ile Ile Cys Leu	65	70	75
10	Pro Phe Val Met Asp Tyr Tyr Val Arg Arg Ser Asp Trp Asn Phe Gly	85	90	95
	Asp Ile Pro Cys Arg Leu Val Leu Phe Met Phe Ala Met Asn Arg Gln	100	105	110
15	Gly Ser Ile Ile Phe Leu Thr Val Val Ala Val Asp Arg Tyr Phe Arg	115	120	125
	Val Val His Pro His His Ala Leu Asn Lys Ile Ser Asn Trp Thr Ala	130	135	140
	Ala Ile Ile Ser Cys Leu Leu Trp Gly Ile Thr Val Gly Leu Thr Val	145	150	155
20	His Leu Leu Lys Lys Lys Leu Leu Ile Gln Asn Gly Pro Ala Asn Val	165	170	175
	Cys Ile Ser Phe Ser Ile Cys His Thr Phe Arg Trp His Glu Ala Met	180	185	190
25	Phe Leu Leu Glu Phe Leu Leu Pro Leu Gly Ile Ile Leu Phe Cys Ser	195	200	205
	Ala Arg Ile Ile Trp Ser Leu Arg Gln Arg Gln Met Asp Arg His Ala	210	215	220
	Lys Ile Lys Arg Ala Ile Thr Phe Ile Met Val Val Ala Ile Val Phe	225	230	235
30	Val Ile Cys Phe Leu Pro Ser Val Val Val Arg Ile Arg Ile Phe Trp	245	250	255
	Leu Leu His Thr Ser Gly Thr Gln Asn Cys Glu Val Tyr Arg Ser Val	260	265	270
35	Asp Leu Ala Phe Phe Ile Thr Leu Ser Phe Thr Tyr Met Asn Ser Met	275	280	285
	Leu Asp Pro Val Val Tyr Tyr Phe Ser Ser Pro Ser Phe Pro Asn Phe	290	295	300

87

Phe Ser Thr Leu Ile Asn Arg Cys Leu Gln Arg Lys Met Thr Gly Glu
 305 310 315 320
 Pro Asp Asn Asn Arg Ser Thr Ser Val Glu Leu Thr Gly Asp Pro Asn
 325 330 335
 5 Lys Thr Arg Gly Ala Pro Glu Ala Leu Met Ala Asn Ser Gly Glu Pro
 340 345 350
 Trp Ser Pro Ser Tyr Leu Gly Pro Thr Ser Asn Asn His Ser Lys Lys
 355 360 365
 10 Gly His Cys His Gln Glu Pro Ala Ser Leu Glu Lys Gln Leu Gly Cys
 370 375 380
 Cys Ile Glu
 385

(110) INFORMATION FOR SEQ ID NO:109:

- (i) SEQUENCE CHARACTERISTICS:
 15 (A) LENGTH: 37 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
 (ii) MOLECULE TYPE: DNA (genomic)
 20 (iv) ANTI-SENSE: NO
 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:109:

ACCATGGCTT GCAATGGCAG TCGGCCAGG GGGCACT

37

(111) INFORMATION FOR SEQ ID NO:110:

- (i) SEQUENCE CHARACTERISTICS:
 25 (A) LENGTH: 39 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
 (ii) MOLECULE TYPE: DNA (genomic)
 30 (iv) ANTI-SENSE: YES
 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:110:

CGACCAGGAC AAACAGCATC TTGGTCACTT GTCCTCCGGC

39

(112) INFORMATION FOR SEQ ID NO:111:

- (i) SEQUENCE CHARACTERISTICS:
 35 (A) LENGTH: 39 base pairs
 (B) TYPE: nucleic acid

- (C) STRANDEDNESS: single
(D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- 5 (iv) ANTI-SENSE: NO
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:111:
- GACCAAGATG CTGTTTGTCC TGGTCGTGGT GTTTGGCAT 39
- (113) INFORMATION FOR SEQ ID NO:112:
- 10 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 35 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- 15 (iv) ANTI-SENSE: YES
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:112:
- CGGAATTCAG GATGGATCGG TCTCTGTGCTG CGCCT 35
- (114) INFORMATION FOR SEQ ID NO:113:
- 20 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 1212 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- 25 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:113:
- ATGGCTTGCA ATGSCAGTGC GCCCAGGGGG CACTTTGACC CTGAGGACTT GAACCTGACT 60
- GACGAGGCAC TGAGACTCAA GTACCTGGGG CCCAGCAGA CAGAGCTGTT CATGCCCATC 120
- TGTGCCACAT ACCTGCTGAT CTTCTGTGGT GCGCTGTGG GCAATGGGCT GACCTGTCTG 180
- GTCACTCTGC GCCACAAGCG CATGCGCACG CCTACCAACT ACTACCTCTT CAGCCTGGCC 240
- 30 GTGTGCGACC TGCTGTGCT GCTGGTGGGC CTGCCCTGG AGCTCTATGA GATGTGGCAC 300
- AACTACCCCT TCCTGCTGGG CGTTGGTGGC TGCTATTTC GCACGCTACT GTTTGAGATG 360
- GTCTGCCTGG CCTCAGTGCT CAACGTCACT GCCCTGAGCG TGAACGCTA TGTGGCCGTG 420
- GTGCACCCAC TCCAGGCCAG GTCCATGGTG ACGCGGGCCC ATGTGCGCCG AGTGCTTGGG 480

GCCGCTGGG GTCTTGCCAT GCTCTGCTCC CTGCCCAACA CCAGCCTGCA CGGCATCCGG 540
 CAGCTGCACG TGCCCTGCCG GGGCCCAGTG CCAGACTCAG CTGTTTGATC GCTGCTCCGC 600
 CCACGGGCCC TCTACACAT GGTAGTGAG ACCACCGCGC TGCTCTCTTT CTGCCTGCC 660
 ATGGCCATCA TGAGCGTGCT CTACCTGCTC ATTGGGCTGC GACTGCGGCG GGAGAGGCTG 720
 5 CTGCTCATGC AGGAGGCCAA GGGCAGGGGC TCTGCAGCAG CCAGGTCCAG ATACACCTGC 780
 AGGCTCCAGC AGCAGGATCG GGGCCGGAGA CAAGTGACCA AGATGCTGTT TGTCTGGTC 840
 GTGGTGTITG GCATCTGCTG GGGCCCGTTC CACGCCGACC GCGTCATGTG GAGCGTCGTG 900
 TCACAGTGGA CAGATGGCCT GCACCTGGCC TTCCAGCAGC TGACAGTCAT CTCGGGCATC 960
 TTCTTCTACC TGGGCTCGCG GGGCAACCCC GTGCTCTATA GCCTCATGTC CAGCCGCTTC 1020
 10 CGAGAGACCT TCCAGGAGCG CCTGTGCTTC GGGGCTGTCT GCCATCGCCT CAGACCCCGC 1080
 CACAGCTCCC ACAGCCTCAG CAGGATGACC ACAGGCAGCA CCCTGTGTGA TGTGGGCTCC 1140
 CTGGGCAAGT GGGTCCACCC CTTGGCTGGG AACGATGGCC CAGAGGCGCA GCAAGAGACC 1200
 GATCCATCCT GA 1212

(115) INFORMATION FOR SEQ ID NO:114:

- 15 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 403 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

- 20 (ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:114:

Met Ala Cys Asn Gly Ser Ala Ala Arg Gly His Phe Asp Pro Glu Asp
 1 5 10 15
 Leu Asn Leu Thr Asp Glu Ala Leu Arg Leu Lys Tyr Leu Gly Pro Gln
 20 25 30
 Gln Thr Glu Leu Phe Met Pro Ile Cys Ala Thr Tyr Leu Leu Ile Phe
 35 40 45
 Val Val Gly Ala Val Gly Asn Gly Leu Thr Cys Leu Val Ile Leu Arg
 50 55 60
 30 His Lys Ala Met Arg Thr Pro Thr Asn Tyr Tyr Leu Phe Ser Leu Ala
 65 70 75 80
 Val Ser Asp Leu Leu Val Leu Leu Val Gly Leu Pro Leu Glu Leu Tyr
 85 90 95

90

Glu Met Trp His Asn Tyr Pro Phe Leu Leu Gly Val Gly Gly Cys Tyr
 100 105 110

Phe Arg Thr Leu Leu Phe Glu Met Val Cys Leu Ala Ser Val Leu Asn
 115 120 125

5 Val Thr Ala Leu Ser Val Glu Arg Tyr Val Ala Val Val His Pro Leu
 130 135 140

Gln Ala Arg Ser Met Val Thr Arg Ala His Val Arg Arg Val Leu Gly
 145 150 155 160

10 Ala Val Trp Gly Leu Ala Met Leu Cys Ser Leu Pro Asn Thr Ser Leu
 165 170 175

His Gly Ile Arg Gln Leu His Val Pro Cys Arg Gly Pro Val Pro Asp
 180 185 190

Ser Ala Val Cys Met Leu Val Arg Pro Arg Ala Leu Tyr Asn Met Val
 195 200 205

15 Val Gln Thr Thr Ala Leu Leu Phe Phe Cys Leu Pro Met Ala Ile Met
 210 215 220

Ser Val Leu Tyr Leu Leu Ile Gly Leu Arg Leu Arg Arg Glu Arg Leu
 225 230 235 240

20 Leu Leu Met Gln Glu Ala Lys Gly Arg Gly Ser Ala Ala Ala Arg Ser
 245 250 255

Arg Tyr Thr Cys Arg Leu Gln Gln His Asp Arg Gly Arg Arg Gln Val
 260 265 270

Thr Lys Met Leu Phe Val Leu Val Val Phe Gly Ile Cys Trp Ala
 275 280 285

25 Pro Phe His Ala Asp Arg Val Met Trp Ser Val Val Ser Gln Trp Thr
 290 295 300

Asp Gly Leu His Leu Ala Phe Gln His Val His Val Ile Ser Gly Ile
 305 310 315 320

30 Phe Phe Tyr Leu Gly Ser Ala Ala Asn Pro Val Leu Tyr Ser Leu Met
 325 330 335

Ser Ser Arg Phe Arg Glu Thr Phe Gln Glu Ala Leu Cys Leu Gly Ala
 340 345 350

Cys Cys His Arg Leu Arg Pro Arg His Ser Ser His Ser Leu Ser Arg
 355 360 365

35 Met Thr Thr Gly Ser Thr Leu Cys Asp Val Gly Ser Leu Gly Ser Trp
 370 375 380

Val His Pro Leu Ala Gly Asn Asp Gly Pro Glu Ala Gln Gln Glu Thr

385

390

395

400

Asp Pro Ser

(116) INFORMATION FOR SEQ ID NO:115:

5

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 30 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: single
 - (D) TOPOLOGY: linear

10

- (ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:115:

GGAGCTTCA GGCCAAAGA TGGGGAACAT

30

(117) INFORMATION FOR SEQ ID NO:116:

15

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 30 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: single
 - (D) TOPOLOGY: linear

- (ii) MOLECULE TYPE: DNA (genomic)

20

- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:116:

GTGGATCCAC CCGCGGAGGA CCCAGGCTAG

30

(118) INFORMATION FOR SEQ ID NO:117:

25

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 1098 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: single
 - (D) TOPOLOGY: linear

- (ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:117:

30

ATGGGGAACA TCATGTCGAGA CAACTCCTCG ATGAGCTGTA CCATCGACCA TACCATCCAC

60

CAGACGCTGG CCCCGTGGT CTATGTTACC GTGCTGGTGG TGGCTTCCG GGCCAACCTGC

120

CTGTCCCTCT ACTTCGGCTA CCTGCAGATC AAGGCCCGGA ACGAGCTGGG CGTGATACCTG

180

TGCAACCTGA CGGTGGCCGA CCTCTTCTAC ATCTGCTCGC TGCCCTTCTG GCTGCAGTAC

240

GTGCTGCAGC ACGACAACCT GTCTCACGGC GACCTGTCTT GCCAGGTGTG CGGCATCCTC

300

35

CTGTACGAGA ACATCTACAT CAGCGTGGGC TTCCTCTGCT GCATCTCCGT GGACCGCTAC

360

CTGGCTGTGG CCCATCCCTT CCGCTTCCAC CAGTTCCGGA CCCTGAAGSC GGCCGTCGGC 420
 GTCAGCGTGG TCATCTGGGC CAAGGAGCTG CTGACCAGCA TCTACTTCCT GATGCACGAG 480
 GAGGTCATCG AGGACAGAAA CCAGCACCGC GTGTGCTTTG AGCACTAACC CATCCAGGCA 540
 TGGCAGCGCG CCATCAACTA CTACCGCTTC CTGTGGGCT TCCTCTTCCC CATCTGCCTG 600
 5 CTGCTGGCGT CCTACCAGGG CATCTTGCGC GCCGTGCGCC GGAGCCACGG CACCCAGAAG 660
 AGCCGCAAGG ACCAGATCCA GCGGCTGGTG CTCAGCACCG TGGTCATCTT CTGCGCTGCG 720
 TTCTGCCCTT ACCACGTGT GCTGCTGGTG CGCAGCGTCT GGGAGGCCAG CTGCGACTTC 780
 GCCAAGGGCG TTTTCAACGC CTACCACTTC TCCCTCTGCG TCACCAGCTT CAACTGCGTC 840
 GCCGACCCCG TGCTCTACTG CTTCTGTCAGC GAGACCACCC ACCGGGACCT GGCCCGCCTC 900
 10 CGCGGGGCTT GCCTGGCCTT CCTCACCTGC TCCAGGACCG GCCGGGCCAG GGAGGCCTAC 960
 CCGCTGGGTG CCCCCGAGGC CTCGGGAAA AGCGGGGCC AGGGTGAGGA GCGCGAGCTG 1020
 TTGACCAAGC TCCACCCGCG CTTCAGACC CCTAACTCGC CAGGGTCGGG CGGGTCCCC 1080
 ACGGGCAGGT TGGCCTAG 1098

(119) INFORMATION FOR SEQ ID NO:118:

- 15 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 365 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

- 20 (ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:118:

Met Gly Asn Ile Thr Ala Asp Asn Ser Ser Met Ser Cys Thr Ile Asp
 1 5 10 15
 His Thr Ile His Gln Thr Leu Ala Pro Val Val Tyr Val Thr Val Leu
 20 25 30
 Val Val Gly Phe Pro Ala Asn Cys Leu Ser Leu Tyr Phe Gly Tyr Leu
 35 40 45
 Gln Ile Lys Ala Arg Asn Glu Leu Gly Val Tyr Leu Cys Asn Leu Thr
 50 55 60
 30 Val Ala Asp Leu Phe Tyr Ile Cys Ser Leu Pro Phe Trp Leu Gln Tyr
 65 70 75 80
 Val Leu Gln His Asp Asn Trp Ser His Gly Asp Leu Ser Cys Gln Val
 85 90 95

93

Cys Gly Ile Leu Leu Tyr Glu Asn Ile Tyr Ile Ser Val Gly Phe Leu
 100 105 110
 Cys Cys Ile Ser Val Asp Arg Tyr Leu Ala Val Ala His Pro Phe Arg
 115 120 125
 5 Phe His Gln Phe Arg Thr Leu Lys Ala Ala Val Gly Val Ser Val Val
 130 135 140
 Ile Trp Ala Lys Glu Leu Leu Thr Ser Ile Tyr Phe Leu Met His Glu
 145 150 155 160
 10 Glu Val Ile Glu Asp Glu Asn Gln His Arg Val Cys Phe Glu His Tyr
 165 170 175
 Pro Ile Gln Ala Trp Gln Arg Ala Ile Asn Tyr Tyr Arg Phe Leu Val
 180 185 190
 Gly Phe Leu Phe Pro Ile Cys Leu Leu Leu Ala Ser Tyr Gln Gly Ile
 195 200 205
 15 Leu Arg Ala Val Arg Arg Ser His Gly Thr Gln Lys Ser Arg Lys Asp
 210 215 220
 Gln Ile Gln Arg Leu Val Leu Ser Thr Val Val Ile Phe Leu Ala Cys
 225 230 235 240
 20 Phe Leu Pro Tyr His Val Leu Leu Leu Val Arg Ser Val Trp Glu Ala
 245 250 255
 Ser Cys Asp Phe Ala Lys Gly Val Phe Asn Ala Tyr His Phe Ser Leu
 260 265 270
 Leu Leu Thr Ser Phe Asn Cys Val Ala Asp Pro Val Leu Tyr Cys Phe
 275 280 285
 25 Val Ser Glu Thr Thr His Arg Asp Leu Ala Arg Leu Arg Gly Ala Cys
 290 295 300
 Leu Ala Phe Leu Thr Cys Ser Arg Thr Gly Arg Ala Arg Glu Ala Tyr
 305 310 315 320
 30 Pro Leu Gly Ala Pro Glu Ala Ser Gly Lys Ser Gly Ala Gln Gly Glu
 325 330 335
 Glu Pro Glu Leu Leu Thr Lys Leu His Pro Ala Phe Gln Thr Pro Asn
 340 345 350
 Ser Pro Gly Ser Gly Gly Phe Pro Thr Gly Arg Leu Ala
 355 360 365

35 (120) INFORMATION FOR SEQ ID NO:119:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 26 base pairs

- (B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- 5 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:119:
- GACCTCGAGT CCTTCTACAC CTCATC 26
- (121) INFORMATION FOR SEQ ID NO:120:
- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 30 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear
- 10 (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:120:
- 15 TGCTCTAGAT TCCAGATAGG TGAAACTTG 30
- (122) INFORMATION FOR SEQ ID NO:121:
- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 1416 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear
- 20 (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:121:
- ATGGATATTC TTGTGAAGA AAATACTTCT TTGAGCTCAA CTACGAAGTC CCTAATGCAA 60
- 25 TTAATGATG ACAACAGGCT CTACAGTAAT GACTTTAACT CCGGAGAAGC TAACACTTCT 120
- GATGCATTTA ACTGGACAGT CGACTCTGAA AATCGAAGCA ACCTTTCCTG TGAAGGGTGC 180
- CTCTCACCCT CGTGTCTCTC CTACTTCAT CTCAGGAAA AAAACTGGTC TGCTTTACTG 240
- ACAGCCGTAG TGATTATTCT AACTATTGCT GGAAACATAC TCGTCATCAT GGCAGTGTCC 300
- CTAGAGAAAA AGCTGCAGAA TGCCACCAAC TATTTCTGTA TGCACTTGC CATAGCTGAT 360
- 30 ATGCTGCTGG GTTTCCTTGT CATGCCGTG TCCATGTTAA CCATCCTGTA TGGGTACCGG 420
- TGGCCTCTGC CGAGCAAGCT TTGTGCAGTC TGGATTTACC TGGACGTGCT CTTCTCCACG 480
- GCCTCCATCA TGCACTCTCG CGCCATCTCG CTGGACCGCT ACGTCGCCAT CCAGAATCCC 540
- ATCCACCACA GCCGCTTCAA CTCCAGAACT AAGGCATTTC TGAAATCAT TGCTGTTTGG 600

ACCATATCAG TAGGTATATC CATGCCAATA CCAGTCTTTG GGCTACAGGA CGATTGGAAG 660
 GTCTTTAAGG AGGGGAGTTG CTTACTCGCC GATGATAACT TTGTCTGAT CGGCTCTTTT 720
 GTGTCAATTT TCATTCCCTT AACCATCATG GTGATCACCT ACTTCTAAC TATCAAGTCA 780
 CTCAGAAAG AAGCTACTTT GTGTGTAAGT GATCTTGGCA CACGGGCCAA ATTAGCTTCT 840
 5 TTCAGCTTCC TCCCTCAGAG TTCTTTGTCT TCAGAAAAGC TCTTCCAGCG GTCGATCCAT 900
 AGGGAGCCAG GGTCTACAC AGGCAGGAGG ACTATGCAGT CCATCAGCAA TGAGCAAAAG 960
 GCATGCAAGG TGCTGGGCAT CGTCTTCTTC CTGTTTGTGG TGATGTGTGG CCCTTTCTTC 1020
 ATCACAACA TCATGCCCGT CATCTGCAA GAGTCTGCA ATGAGGATGT CATTGGGGCC 1080
 CTGCTCAATG TGTTTGTTTG GATCGGTTAT CTCTCTTCA GAGTCAACCC ACTAGTCTAC 1140
 10 ACACGTGTCA ACAAGACCTA TAGGTCAGCC TTTTCACGGT ATATTCAAGT TCAGTACAAG 1200
 GAAAACAAAA AACCATTGCA GTTAATTTTA GTGAACACAA TACCGGCTTT GGCCTACAAG 1260
 TCTAGCCAAC TTCAATGGG ACAAAAAAAG AATTCAARGC AAGATGCCAA GACAACAGAT 1320
 AATGACTGCT CAATGGTTGC TCTAGGAAAG CAGTATTCTG AAGAGGCTTC TAAAGACAAT 1380
 AGCGACGGAG TGAATGAAAA GGTGAGCTGT GTGTGA 1416

15 (123) INFORMATION FOR SEQ ID NO:122:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 471 amino acids

(B) TYPE: amino acid

(C) STRANDEDNESS:

(D) TOPOLOGY: not relevant

20

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:122:

Met Asp Ile Leu Cys Glu Glu Asn Thr Ser Leu Ser Ser Thr Thr Asn
 1 5 10 15
 25 Ser Leu Met Gln Leu Asn Asp Asp Asn Arg Leu Tyr Ser Asn Asp Phe
 20 25 30
 Asn Ser Gly Glu Ala Asn Thr Ser Asp Ala Phe Asn Trp Thr Val Asp
 35 40 45
 30 Ser Glu Asn Arg Thr Asn Leu Ser Cys Glu Gly Cys Leu Ser Pro Ser
 50 55 60
 Cys Leu Ser Leu Leu His Leu Gln Glu Lys Asn Trp Ser Ala Leu Leu
 65 70 75 80

Thr Ala Val Val Ile Ile Leu Thr Ile Ala Gly Asn Ile Leu Val Ile
 85 90 95
 Met Ala Val Ser Leu Glu Lys Lys Leu Gln Asn Ala Thr Asn Tyr Phe
 100 105 110
 5 Leu Met Ser Leu Ala Ile Ala Asp Met Leu Leu Gly Phe Leu Val Met
 115 120 125
 Pro Val Ser Met Leu Thr Ile Leu Tyr Gly Tyr Arg Trp Pro Leu Pro
 130 135 140
 10 Ser Lys Leu Cys Ala Val Trp Ile Tyr Leu Asp Val Leu Phe Ser Thr
 145 150 155 160
 Ala Ser Ile Met His Leu Cys Ala Ile Ser Leu Asp Arg Tyr Val Ala
 165 170 175
 Ile Gln Asn Pro Ile His His Ser Arg Phe Asn Ser Arg Thr Lys Ala
 180 185 190
 15 Phe Leu Lys Ile Ile Ala Val Trp Thr Ile Ser Val Gly Ile Ser Met
 195 200 205
 Pro Ile Pro Val Phe Gly Leu Gln Asp Asp Ser Lys Val Phe Lys Glu
 210 215 220
 20 Gly Ser Cys Leu Leu Ala Asp Asp Asn Phe Val Leu Ile Gly Ser Phe
 225 230 235 240
 Val Ser Phe Phe Ile Pro Leu Thr Ile Met Val Ile Thr Tyr Phe Leu
 245 250 255
 Thr Ile Lys Ser Leu Gln Lys Glu Ala Thr Leu Cys Val Ser Asp Leu
 260 265 270
 25 Gly Thr Arg Ala Lys Leu Ala Ser Phe Ser Phe Leu Pro Gln Ser Ser
 275 280 285
 Leu Ser Ser Glu Lys Leu Phe Gln Arg Ser Ile His Arg Glu Pro Gly
 290 295 300
 30 Ser Tyr Thr Gly Arg Arg Thr Met Gln Ser Ile Ser Asn Glu Gln Lys
 305 310 315 320
 Ala Cys Lys Val Leu Gly Ile Val Phe Phe Leu Phe Val Val Met Trp
 325 330 335
 Cys Pro Phe Phe Ile Thr Asn Ile Met Ala Val Ile Cys Lys Glu Ser
 340 345 350
 35 Cys Asn Glu Asp Val Ile Gly Ala Leu Leu Asn Val Phe Val Trp Ile
 355 360 365
 Gly Tyr Leu Ser Ser Ala Val Asn Pro Leu Val Tyr Thr Leu Phe Asn

	370		375		380
	Lys Thr Tyr Arg Ser Ala Phe Ser Arg Tyr Ile Gln Cys Gln Tyr Lys				
	365		390		395 400
5	Glu Asn Lys Lys Pro Leu Gln Leu Ile Leu Val Asn Thr Ile Pro Ala				
		405		410	415
	Leu Ala Tyr Lys Ser Ser Gln Leu Gln Met Gly Gln Lys Lys Asn Ser				
		420		425	430
	Lys Gln Asp Ala Lys Thr Thr Asp Asn Asp Cys Ser Met Val Ala Leu				
		435		440	445
10	Gly Lys Gln Tyr Ser Glu Glu Ala Ser Lys Asp Asn Ser Asp Gly Val				
		450		455	460
	Asn Glu Lys Val Ser Cys Val				
	465		470		

(124) INFORMATION FOR SEQ ID NO:123:

- 15 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 27 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- 20 (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:123:

GACCTCGAGG TTGCTTAAGA CTGAAGC

27

(125) INFORMATION FOR SEQ ID NO:124:

- 25 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 27 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- 30 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:124:

ATTTCTAGAC ATATGTAGCT TGTACCG

27

(126) INFORMATION FOR SEQ ID NO:125:

- 35 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 1377 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:125:

	ATGGTGAACC	TGAGGAATGC	GGTGCAATTCA	TTCCTTGTGC	ACCTAATTGG	CCTATTGGTT	60
	TGGCAATGTG	ATATTCTGT	GAGCCCAGTA	GCAGCTATAG	TAAGTACAT	TTTCAATACC	120
5	TCCGATGGTG	GACGCTTCAA	ATTCCCAGAC	GGGGTACAAA	ACTGGCCAGC	ACTTTCAATC	180
	GTCATCATAA	TAATCATGAC	AATAGGTGGC	AACATCCTTG	TGATCATGGC	AGTAAGCATG	240
	GAAAAGAAAC	TGCACAATGC	CACCAATTAC	TTCITTAATG	CCCTAGCCAT	TGCTGATATG	300
	CTAGTGGGAC	TACTTGTCAT	GCCCCTGTCT	CTCCTGGCAA	TCCTTTATGA	TTATGTCCTGG	360
	CCACTACCTA	GATATTGTG	CCCCGTCTGG	ATTCTTTTAG	ATGTTTATT	TTCAACAGCG	420
10	TCCATCATGC	ACCTCTGCGC	TATATCGCTG	GATCGGTATG	TAGCAATACG	TAATCCTATT	480
	GAGCATAGCC	GTTTCAATTC	GCGGACTAAG	GCCATCATGA	AGATTGCTAT	TGTTTGGGCA	540
	ATTTCTATAG	GTGTATCAGT	TCCTATCCCT	GTGATTGGAC	TGAGGGACGA	AGAAAAGGTG	600
	TTCGTGAACA	ACACGACGTG	CGTGCTCAAC	GACCCAAATT	TCSTTCTTAT	TGGGTCTTTC	660
	GTAGCTTTCT	TCATACCGCT	GACGATTATG	GTGATTACGT	ATTGCCTGAC	CATCTACGTT	720
15	CTGCGCCGAC	AAGCTTTGAT	GTTACTGCAC	GGCCACACCG	AGGAACCGCC	TGGACTAAGT	780
	CTGAGTTTCC	TGAAGTGCTG	CAAGAGGAAT	ACGGCCGAGG	AAGAGAACTC	TGCAAAACCT	840
	AAACAAGACC	AGAACGCACG	CCGAAGAAAG	AAGAAGGAGA	GACGTCCTAG	GGGCACCATG	900
	CAGGCTATCA	ACAATGAAAG	AAAAGCTTCG	AAAGTCCTTG	GGATTGTTTT	CTTTGTGTTT	960
	CTGATCATGT	GGTGCCCAAT	TTTCATTACC	AATATTCTGT	CTGTCTTTTG	TGAGAAGTCC	1020
20	TGTAACCAAA	AGCTCATGGA	AAAGCTTCTG	AATGTGTTTG	TTTGAGATTG	CTATGTTTGT	1080
	TCAGGAATCA	ATCCTCTGCT	GTATACTCTG	TTCAACAAAA	TTTACCGAAG	GGCATTCTCC	1140
	AACTATTTCG	GTTGCAATTA	TAAGGTAGAG	AAAAAGCCTC	CTGTCAGGCA	GATTCCAAGA	1200
	GTTGCCGCCA	CTGCTTTGTC	TGGGAGGGAG	CTTAATGTTA	ACATTATATG	GCATACCAAT	1260
	GAACCGGTGA	TCGAGAARGC	CAGTGACAAT	GAGCCCGGTA	TAGAGATGCA	AGTTGAGAAT	1320
25	TTAGAGTTAC	CAGTAAATCC	CTCCAGTGTG	GTTAGCGAAA	GGATTAGCAG	TGTGTGA	1377

(127) INFORMATION FOR SEQ ID NO:126:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 458 amino acids

(B) TYPE: amino acid

(C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:126:

```

5  Met Val Asn Leu Arg Asn Ala Val His Ser Phe Leu Val His Leu Ile
    1             5             10             15

    Gly Leu Leu Val Trp Gln Cys Asp Ile Ser Val Ser Pro Val Ala Ala
      20             25             30

10  Ile Val Thr Asp Ile Phe Asn Thr Ser Asp Gly Gly Arg Phe Lys Phe
    35             40             45

    Pro Asp Gly Val Gln Asn Trp Pro Ala Leu Ser Ile Val Ile Ile Ile
    50             55             60

    Ile Met Thr Ile Gly Gly Asn Ile Leu Val Ile Met Ala Val Ser Met
    65             70             75             80

15  Glu Lys Lys Leu His Asn Ala Thr Asn Tyr Phe Leu Met Ser Leu Ala
    85             90             95

    Ile Ala Asp Met Leu Val Gly Leu Leu Val Met Pro Leu Ser Leu Leu
    100            105            110

20  Ala Ile Leu Tyr Asp Tyr Val Trp Pro Leu Pro Arg Tyr Leu Cys Pro
    115            120            125

    Val Trp Ile Ser Leu Asp Val Leu Phe Ser Thr Ala Ser Ile Met His
    130            135            140

    Leu Cys Ala Ile Ser Leu Asp Arg Tyr Val Ala Ile Arg Asn Pro Ile
    145            150            155            160

25  Glu His Ser Arg Phe Asn Ser Arg Thr Lys Ala Ile Met Lys Ile Ala
    165            170            175

    Ile Val Trp Ala Ile Ser Ile Gly Val Ser Val Pro Ile Pro Val Ile
    180            185            190

30  Gly Leu Arg Asp Glu Glu Lys Val Phe Val Asn Asn Thr Thr Cys Val
    195            200            205

    Leu Asn Asp Pro Asn Phe Val Leu Ile Gly Ser Phe Val Ala Phe Phe
    210            215            220

    Ile Pro Leu Thr Ile Met Val Ile Thr Tyr Cys Leu Thr Ile Tyr Val
    225            230            235            240

35  Leu Arg Arg Gln Ala Leu Met Leu Leu His Gly His Thr Glu Glu Pro
    245            250            255
  
```

100

Pro Gly Leu Ser Leu Asp Phe Leu Lys Cys Cys Lys Arg Asn Thr Ala
260 265 270

Glu Glu Glu Asn Ser Ala Asn Pro Asn Gln Asp Gln Asn Ala Arg Arg
275 280 285

5 Arg Lys Lys Lys Glu Arg Arg Pro Arg Gly Thr Met Gln Ala Ile Asn
290 295 300

Asn Glu Arg Lys Ala Ser Lys Val Leu Gly Ile Val Phe Phe Val Phe
305 310 315 320

10 Leu Ile Met Trp Cys Pro Phe Phe Ile Thr Asn Ile Leu Ser Val Leu
325 330 335

Cys Glu Lys Ser Cys Asn Gln Lys Leu Met Glu Lys Leu Leu Asn Val
340 345 350

Phe Val Trp Ile Gly Tyr Val Cys Ser Gly Ile Asn Pro Leu Val Tyr
355 360 365

15 Thr Leu Phe Asn Lys Ile Tyr Arg Arg Ala Phe Ser Asn Tyr Leu Arg
370 375 380

Cys Asn Tyr Lys Val Glu Lys Lys Pro Pro Val Arg Gln Ile Pro Arg
385 390 395 400

20 Val Ala Ala Thr Ala Leu Ser Gly Arg Glu Leu Asn Val Asn Ile Tyr
405 410 415

Arg His Thr Asn Glu Pro Val Ile Glu Lys Ala Ser Asp Asn Glu Pro
420 425 430

Gly Ile Glu Met Gln Val Glu Asn Leu Glu Leu Pro Val Asn Pro Ser
435 440 445

25 Ser Val Val Ser Glu Arg Ile Ser Ser Val
450 455

(128) INFORMATION FOR SEQ ID NO:127:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 30 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:127:

35 GGTAAGCTTG GCAGTCCACG CCAGGCCTTC

30

(129) INFORMATION FOR SEQ ID NO:128:

101

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 30 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:128:

TCCGAATTCT CTGTAGACAC AAGGCTTTGG

30

(130) INFORMATION FOR SEQ ID NO:129:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 1068 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:129:

ATGGATCAGT TCCCTGAATC AGTGACAGAA AACTTTGAGT ACGATGATTT GCGTGAGGCC 60

TGTTATATTG GGGACATCGT GGTCTTTGGG ACTGTGTCC TGTCATATT CTACTCCGTC 120

ATCTTTGCCA TTGGCCTGGT GGGAAATTTG TTGGTAGTGT TTGCCCTCAC CAACAGCAAG 180

AAGCCCAAGA GTGTCAACGA CATTTACCTC CTGAACCTGG CCTGTGCTGA TCTGTGTTT 240

GTAGCCACTT TGCCCTTCTG GACTCACTAT TTGATAAATG AAAAGGGCCT CCACAATGCC 300

ATGTGCAAAT TCACATACCGC CTTCTTCTTC ATCGGCTTTT TTGGAAGCAT ATTCTTCATC 360

ACCCTCATCA GCATTGATAG GTACCTGGCC ATCGTCTGG CCGCCAATC CATGAACAAC 420

CGGACCGTGC AGCATGGCGT CACCATCAGC CTAGGCGTCT GGGCAGCAGC CATTTTGGTG 480

GCAGACCCCC AGTTCATGTT CACAAGCAG AAAGAAATG AATGCCTTGG TGACTACCCC 540

GAGGTCCTCC AGGAAATCTG GCCCGTGCTC CGCAATGTGG AAACAATTT TCTTGCTTC 600

CTACTCCCCC TGCTCATATT GAGTATTGTC TACTTCAGAA TCATCCAGAC GCTGTTTTCC 660

TGCAAGAAC ACAAAGAAC CAAAGCCATT AAAGTATGCC TTCTGGTGGT CATCGTGT 720

TTCTCTTCTT GGACACCCCTA CAACGTTATG ATTTCTCTG AGACGCTTAA GCTCTATGAC 780

TTCTTTCCCA GTTGTGACAT GAGGAAGGAT CTGAGGCTGG CCCTCAGTGT GACTGAGACG 840

GTTGCATTTA GCCATTGTTG CCTGAATCCT CTCATCTATG CATTGTGCTG GGAGAAGTTC 900

AGAAGATACC TTTACCACCT GTATGGGAAA TGCCTGGCTG TCCTGTGTGG GCGCTCAGTC 960

102

CACGTTGATT TCTCTCATC TGAATCACAA AGGAGCAGGC ATGGAAGTGT TCTGAGCAGC 1020

AATTTTACTT ACCACACGAG TGATGGAGAT GCATTGCTCC TTCTCTGA 1068

(131) INFORMATION FOR SEQ ID NO:130:

- 5 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 355 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

- 10 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:130:

Met Asp Gln Phe Pro Glu Ser Val Thr Glu Asn Phe Glu Tyr Asp Asp
 1 5 10 15

Leu Ala Glu Ala Cys Tyr Ile Gly Asp Ile Val Val Phe Gly Thr Val
 20 25 30

- 15 Phe Leu Ser Ile Phe Tyr Ser Val Ile Phe Ala Ile Gly Leu Val Gly
 35 40 45

Asn Leu Leu Val Val Phe Ala Leu Thr Asn Ser Lys Lys Pro Lys Ser
 50 55 60

- 20 Val Thr Asp Ile Tyr Leu Leu Asn Leu Ala Leu Ser Asp Leu Leu Phe
 65 70 75 80

Val Ala Thr Leu Pro Phe Trp Thr His Tyr Leu Ile Asn Glu Lys Gly
 85 90 95

Leu His Asn Ala Met Cys Lys Phe Thr Thr Ala Phe Phe Phe Ile Gly
 100 105 110

- 25 Phe Phe Gly Ser Ile Phe Phe Ile Thr Val Ile Ser Ile Asp Arg Tyr
 115 120 125

Leu Ala Ile Val Leu Ala Ala Asn Ser Met Asn Asn Arg Thr Val Gln
 130 135 140

- 30 His Gly Val Thr Ile Ser Leu Gly Val Trp Ala Ala Ala Ile Leu Val
 145 150 155 160

Ala Ala Pro Gln Phe Met Phe Thr Lys Gln Lys Glu Asn Glu Cys Leu
 165 170 175

Gly Asp Tyr Pro Glu Val Leu Gln Glu Ile Trp Pro Val Leu Arg Asn
 180 185 190

- 35 Val Glu Thr Asn Phe Leu Gly Phe Leu Leu Pro Leu Leu Ile Met Ser
 195 200 205

103

Tyr Cys Tyr Phe Arg Ile Ile Gln Thr Leu Phe Ser Cys Lys Asn His
 210 215 220

Lys Lys Ala Lys Ala Ile Lys Leu Ile Leu Leu Val Val Ile Val Phe
 225 230 235 240

5 Phe Leu Phe Trp Thr Pro Tyr Asn Val Met Ile Phe Leu Glu Thr Leu
 245 250 255

Lys Leu Tyr Asp Phe Phe Pro Ser Cys Asp Met Arg Lys Asp Leu Arg
 260 265 270

10 Leu Ala Leu Ser Val Thr Glu Thr Val Ala Phe Ser His Cys Cys Leu
 275 280 285

Asn Pro Leu Ile Tyr Ala Phe Ala Gly Glu Lys Phe Arg Arg Tyr Leu
 290 295 300

Tyr His Leu Tyr Gly Lys Cys Leu Ala Val Leu Cys Gly Arg Ser Val
 305 310 315 320

15 His Val Asp Phe Ser Ser Ser Glu Ser Gln Arg Ser Arg His Gly Ser
 325 330 335

Val Leu Ser Ser Asn Phe Thr Tyr His Thr Ser Asp Gly Asp Ala Leu
 340 345 350

20 Leu Leu Leu
 355

(132) INFORMATION FOR SEQ ID NO:131:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 32 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:131:

GATCTCCAGT AGGCATAAGT GGACAATTCT GG

32

30 (133) INFORMATION FOR SEQ ID NO:132:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 30 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:132:

35

CTCCTTCGGT CCTCTATCG TTGTCAGAAG

30

(134) INFORMATION FOR SEQ ID NO:133:

- 5 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 30 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:133:

10 AGAAGGCCAA GATCGCGCGG CTGGCCCTCA

30

(135) INFORMATION FOR SEQ ID NO:134:

- 15 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 30 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:134:

CGGCGCCACC GCACGAAAAA GCTCATCTTC

30

20 (136) INFORMATION FOR SEQ ID NO:135:

- 25 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 33 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:135:

GCCAAGAAGC GGGTGAAGTT CCTGGTGGTG GCA

33

(137) INFORMATION FOR SEQ ID NO:136:

- 30 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 30 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear
- 35 (ii) MOLECULE TYPE: DNA (genomic)

- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:136:
CAGGCGGAAG GTGAAAGTCC TGGTCCTCGT 30
- (138) INFORMATION FOR SEQ ID NO:137:
- 5 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 33 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- 10 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:137:
CGGCGCCTGC GGGCCAAGCG GCTGGTGGTG GTG 33
- (139) INFORMATION FOR SEQ ID NO:138:
- 15 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 31 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:138:
- 20 CCAAGCACAA AGCCAAGAAA GTGACCATCA C 31
- (140) INFORMATION FOR SEQ ID NO:139:
- 25 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 30 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:139:
GCGCCGGCGC ACCAAATGCT TGCTGGTGGT 30
- 30 (141) INFORMATION FOR SEQ ID NO:140:
- 35 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 41 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:140:

CAAAAAGCTG AAGAAATCTA AGAAGATCAT CTTTATTGTC G 41

(142) INFORMATION FOR SEQ ID NO:141:

- 5 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 30 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

10 (ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:141:

CAAGACCAAG GCAAAACGCA TGATCGCCAT 30

(143) INFORMATION FOR SEQ ID NO:142:

- 15 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 30 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

20 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:142:

GTCAAGGAGA AGTCCAAAAG GATCATCATC 30

(144) INFORMATION FOR SEQ ID NO:143:

- 25 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 30 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:143:

30 CGCCGCGTGC GGGCCAAGCA GCTCCTGCTC 30

(145) INFORMATION FOR SEQ ID NO:144:

- 35 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 33 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

107

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:144:

CCTGATAAGC GCTATAAAAT GGTCTGTTT CGA

33

(146) INFORMATION FOR SEQ ID NO:145:

- 5 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 36 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

10 (ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:145:

GAAAGACAAA AGAGAGTCAA GAGGATGTCT TTATTG

36

(147) INFORMATION FOR SEQ ID NO:146:

- 15 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 33 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

20 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:146:

CGGAGAAAGA GGGTGAAACG CACAGCCATC GCC

33

(148) INFORMATION FOR SEQ ID NO:147:

- 25 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 30 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:147:

30 AAGCTTCAGC GGGCCAAGGC ACTGGTCACC

30

(149) INFORMATION FOR SEQ ID NO:148:

- 35 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 30 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:148:

CAGCGGCAGA AGGC?AAAAG GGTGGCCATC

30

(150) INFORMATION FOR SEQ ID NO:149:

- 5 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 30 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

10 (ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:149:

CGGCAGAAGG CGAAGCGCAT GATCCTCGCG

30

(151) INFORMATION FOR SEQ ID NO:150:

- 15 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 30 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

20 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:150:

GAGCGCAACA AGGCCAAAAA GGTGATCATC

30

(152) INFORMATION FOR SEQ ID NO:151:

- 25 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 39 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:151:

30 GGTGTAAACA AAAAGGCTAA AAACACAATT ATTCTTATT

39

(153) INFORMATION FOR SEQ ID NO:152:

- 35 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 27 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:152:

GAGAGCCAGC TCAAGAGCAC CGTGGTG

27

(154) INFORMATION FOR SEQ ID NO:153:

- 5 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 30 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

10 (ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:153:

CCACAAGCAA ACCAAGAAAA TGCTGGCTGT

30

(155) INFORMATION FOR SEQ ID NO:154:

- 15 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 30 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

20 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:154:

CATCAAGTGT ATCATGTGCC AAGTACGCCC

30

(156) INFORMATION FOR SEQ ID NO:155:

- 25 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 34 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:155:

30 CTAGAGAGTC AGATGAAGTG TACAGTAGTG GCAC

34

(157) INFORMATION FOR SEQ ID NO:156:

- 35 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 36 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

110

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:156:

CGGACAAAAG TGAAAACTAA AAAGATGTTT CTCATT

36

(158) INFORMATION FOR SEQ ID NO:157:

- 5 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 33 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

10 (ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:157:

GCTGAGGTTT GCAATAAACT AACCATGTTT GTG

33

(159) INFORMATION FOR SEQ ID NO:158:

- 15 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 29 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

20 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:158:

GGGAGGCCGA GCTGAAAGCC ACCCTGCTC

29

(160) INFORMATION FOR SEQ ID NO:159:

- 25 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 31 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:159:

30 CAAGATCAAG AGAGCCAAAA CCTTCATCAT G

31

(161) INFORMATION FOR SEQ ID NO:160:

- 35 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 31 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:160:

CCGGAGACAA GTGAAGAAGA TGCTGTTTGT C 31

(162) INFORMATION FOR SEQ ID NO:161:

- 5 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 30 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

10 (ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:161:

GCAAGGACCA GATCAAGCGG CTGGTGCTCA 30

(163) INFORMATION FOR SEQ ID NO:162:

- 15 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 34 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

20 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:162:

CAAGAAAGCC AAAGCCAAGA AACTGATCCT TCTG 34

(164) INFORMATION FOR SEQ ID NO:163:

- 25 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 1068 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:163:

30 ATGGAAGATT TGGAGGAAAC ATTATTTGAA GAATTTGAAA ACTATTCCTA TGACCTAGAC 60
 TATTACTCTC TGGAGTCTGA TTTGGAGGAG AAAGTCCAGC TGGGAGTTGT TCACTGGGTC 120
 TCCCTGSGTGT TATATTGTTT GGCCTTTGTT CTGGGAATTC CAGGAAATGC CATCGTCATT 180
 TGGTTACACG GGCCTCAAGTG GAAGAAGACA GTCACCACTC TGTGGTTCCT CAATCTAGCC 240
 ATTGCGGATT TCATTTTCT TCTCTTCTG CCCCTGTACA TCTCTATGT GGCCATGAAT 300

TTCCACTGGC CCTTGGCAT CTGGCTGTGC AAAGCCAATT CCTTCACTGC CCAGTTGAAC 360
 ATGTTTGCCA GTGTTTTTTT CCGACAGTG ATCAGCCTGG ACCACTATAT CCACCTTGATC 420
 CATCCTGTCT TATCTCATCG GCATCGAACC CTCAGAAGCT CTCTGATTGT CATTATATTC 480
 ATCTGGCTTT TGGCTTCTCT AATTGGCGGT CCTGCCCTGT ACTTCCGGGA CACTGTGGAG 540
 5 TTCAATAATC ATACTCTTTG CTATAACAAT TTTCAGAAGC ATGATCCTGA CCTCACTTTG 600
 ATCAGGCACC ATGTTCTGAC TTGGGTGAAA TTTATCATTG GCTATCTCTT CCCTTTGCTA 660
 ACAATAGTAG TTTGCTACTT GTGTCTCATC TTCAAGGTGA AGAAGCGAAC AGTCCTGATC 720
 TCCAGTAGGC ATAAGTGGAC AATTCTGGTT GTGGTTGTGG CTTTGTGGT TTGCTGGACT 780
 CCTTATCACC TGTTTAGCAT TTGGGAGCTC ACCATTCAAC ACAATAGTGA TTCCCACCAT 840
 10 GTGATGCAAG CTGGAATCCC CCTCTCCACT GGTTTGGCAT TCCTCAATAG TTGCTTGAAC 900
 CCCATCCTTT ATGTCTTAAT TAGTAAGAAG TTCCAAGCTC GCTTCCGGTC CTCAGTTGCT 960
 GAGATACTCA AGTACACACT GTGGGAAGTC AGCTGTCTTG GCACAGTGAG TGAACAGCTC 1020
 AGGAACTCAG AAACCAAGAA TCTGTGTCTC CTGGAACAG CTCATAAA 1068

(165) INFORMATION FOR SEQ ID NO:164:

- 15 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 355 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

- 20 (ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:164:

Met Glu Asp Leu Glu Glu Thr Leu Phe Glu Glu Phe Glu Asn Tyr Ser
 1 5 10 15
 Tyr Asp Leu Asp Tyr Tyr Ser Leu Glu Ser Asp Leu Glu Glu Lys Val
 20 25 30
 Gln Leu Gly Val Val His Trp Val Ser Leu Val Leu Tyr Cys Leu Ala
 35 40 45
 Phe Val Leu Gly Ile Pro Gly Asn Ala Ile Val Ile Trp Phe Thr Gly
 50 55 60
 30 Leu Lys Trp Lys Lys Thr Val Thr Thr Leu Trp Phe Leu Asn Leu Ala
 65 70 75 80
 Ile Ala Asp Phe Ile Phe Leu Leu Phe Leu Pro Leu Tyr Ile Ser Tyr
 85 90 95

113

Val Ala Met Asn Phe His Trp Pro Phe Gly Ile Trp Leu Cys Lys Ala
100 105 110

Asn Ser Phe Thr Ala Gln Leu Asn Met Phe Ala Ser Val Phe Phe Leu
115 120 125

5 Thr Val Ile Ser Leu Asp His Tyr Ile His Leu Ile His Pro Val Leu
130 135 140

Ser His Arg His Arg Thr Leu Lys Asn Ser Leu Ile Val Ile Ile Phe
145 150 155 160

10 Ile Trp Leu Leu Ala Ser Leu Ile Gly Gly Pro Ala Leu Tyr Phe Arg
165 170 175

Asp Thr Val Glu Phe Asn Asn His Thr Leu Cys Tyr Asn Asn Phe Gln
180 185 190

Lys His Asp Pro Asp Leu Thr Leu Ile Arg His His Val Leu Thr Trp
195 200 205

15 Val Lys Phe Ile Ile Gly Tyr Leu Phe Pro Leu Leu Thr Met Ser Ile
210 215 220

Cys Tyr Leu Cys Leu Ile Phe Lys Val Lys Lys Arg Thr Val Leu Ile
225 230 235 240

20 Ser Ser Arg His Lys Trp Thr Ile Leu Val Val Val Val Ala Phe Val
245 250 255

Val Cys Trp Thr Pro Tyr His Leu Phe Ser Ile Trp Glu Leu Thr Ile
260 265 270

His His Asn Ser Tyr Ser His His Val Met Gln Ala Gly Ile Pro Leu
275 280 285

25 Ser Thr Gly Leu Ala Phe Leu Asn Ser Cys Leu Asn Pro Ile Leu Tyr
290 295 300

Val Leu Ile Ser Lys Lys Phe Gln Ala Arg Phe Arg Ser Ser Val Ala
305 310 315 320

30 Glu Ile Leu Lys Tyr Thr Leu Trp Glu Val Ser Cys Ser Gly Thr Val
325 330 335

Ser Glu Gln Leu Arg Asn Ser Glu Thr Lys Asn Leu Cys Leu Leu Glu
340 345 350

Thr Ala Gln
355

35 (166) INFORMATION FOR SEQ ID NO:165:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 1089 base pairs

114

(B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

5 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:165:

ATGGGCAACC	ACACGTGGGA	GGGCTGCCAC	GTGGACTCGC	GCGTGGACCA	CCTCTTTCCG	60
CCATCCCTCT	ACATCTTTGT	CATCGGCGTG	GGGCTGCCCA	CCAACGCTCT	GGCTCTGTGG	120
GCGGCCTACC	GCCAGGTGCA	ACAGCGCAAC	GAGCTGGGCG	TCTACCTGAT	GAACCTCAGC	180
ATCGCCGACC	TGCTGTACAT	CTGCACGCTG	CCGCTGTGGG	TGGACTACTT	CCTGCACCAC	240
10 GACAACTGGA	TCCACGGCCC	CGGGTCCTGC	AAGCTCTTTG	GGTTCATCTT	CTACACCAAT	300
ATCTACATCA	GCATCGCCTT	CCTGTGCTGC	ATCTCGGTGG	ACCGCTACCT	GGCTGTGGCC	360
CACCCACTCC	GCTTCGCCCC	CCTGCGCCGC	GTCAAGACCG	CCGTGGCCGT	GAGCTCCGTG	420
GTCTGGGCCA	CGGAGCTGGG	CGCCAACTCG	GCGCCCCGTG	TCCATGACGA	GCTCTCCGA	480
GACCGCTACA	ACCACACCTT	CTGCTTTGAG	AAGTTCCTCA	TGGAAGGCTG	GGTGGCCTGG	540
15 ATGAACCTCT	ATCGGGTGTT	CGTGGGCTTC	CTCTTCCCCT	GGGCGCTCAT	GCTGTGTCG	600
TACCGGGGCA	TCCTGCGGGC	CGTGCGGGGC	AGCGTGTCCA	CCGAGCGCCA	GGAGAAGGCC	660
AAGATCGCGC	GGCTGGCCCT	CAGCCTCATC	GCCATCGTGC	TGGTCTGCTT	TGCGCCCTAT	720
CACGTGCTCT	TGCTGTCCCG	CAGCGCCATC	TACCTGGGCC	GCCCCGGGGA	CTGCGGCTTC	780
GAGGAGCGCG	TCTTTTCTGC	ATACCACAGC	TCACTGGCTT	TCACGAGCTT	CAACTGTGTG	840
20 GCGGACCCCA	TCCTCTACTG	CCTGGTCAAC	GAGGGCGCCC	GCAGCGATGT	GGCCAAGGCC	900
CTGCACAACC	TGCTCCGCTT	TCTGGCCAGC	GACAAGCCCC	AGGAGATGGC	CAATGCCTCG	960
CTCACCTCTG	AGACCCCACT	CACCTCCAAG	AGGAACAGCA	CAGCCAAAGC	CATGACTGGC	1020
AGCTGGGCGG	CCACTCCGCC	TTCCCAGGGG	GACCAGGTGC	AGCTGAAGAT	GCTGCGGCCA	1080
GCACARTGA						1089

25 (167) INFORMATION FOR SEQ ID NO:166:

(i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 362 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

30

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:166:

	Met	Gly	Asn	His	Thr	Trp	Glu	Gly	Cys	His	Val	Asp	Ser	Arg	Val	Asp	1	5	10	15
5	His	Leu	Phe	Pro	Pro	Ser	Leu	Tyr	Ile	Phe	Val	Ile	Gly	Val	Gly	Leu	20	25	30	
	Pro	Thr	Asn	Cys	Leu	Ala	Leu	Trp	Ala	Ala	Tyr	Arg	Gln	Val	Gln	Gln	35	40	45	
	Arg	Asn	Glu	Leu	Gly	Val	Tyr	Leu	Met	Asn	Leu	Ser	Ile	Ala	Asp	Leu	50	55	60	
10	Leu	Tyr	Ile	Cys	Thr	Leu	Pro	Leu	Trp	Val	Asp	Tyr	Phe	Leu	His	His	65	70	75	80
	Asp	Asn	Trp	Ile	His	Gly	Pro	Gly	Ser	Cys	Lys	Leu	Phe	Gly	Phe	Ile	85	90	95	
15	Phe	Tyr	Thr	Asn	Ile	Tyr	Ile	Ser	Ile	Ala	Phe	Leu	Cys	Cys	Ile	Ser	100	105	110	
	Val	Asp	Arg	Tyr	Leu	Ala	Val	Ala	His	Pro	Leu	Arg	Phe	Ala	Arg	Leu	115	120	125	
	Arg	Arg	Val	Lys	Thr	Ala	Val	Ala	Val	Ser	Ser	Val	Val	Trp	Ala	Thr	130	135	140	
20	Glu	Leu	Gly	Ala	Asn	Ser	Ala	Pro	Leu	Phe	His	Asp	Glu	Leu	Phe	Arg	145	150	155	160
	Asp	Arg	Tyr	Asn	His	Thr	Phe	Cys	Phe	Glu	Lys	Phe	Pro	Met	Glu	Gly	165	170	175	
25	Trp	Val	Ala	Trp	Met	Asn	Leu	Tyr	Arg	Val	Phe	Val	Gly	Phe	Leu	Phe	180	185	190	
	Pro	Trp	Ala	Leu	Met	Leu	Leu	Ser	Tyr	Arg	Gly	Ile	Leu	Arg	Ala	Val	195	200	205	
	Arg	Gly	Ser	Val	Ser	Thr	Glu	Arg	Gln	Glu	Lys	Ala	Lys	Ile	Ala	Arg	210	215	220	
30	Leu	Ala	Leu	Ser	Leu	Ile	Ala	Ile	Val	Leu	Val	Cys	Phe	Ala	Pro	Tyr	225	230	235	240
	His	Val	Leu	Leu	Leu	Ser	Arg	Ser	Ala	Ile	Tyr	Leu	Gly	Arg	Pro	Trp	245	250	255	
35	Asp	Cys	Gly	Phe	Glu	Glu	Arg	Val	Phe	Ser	Ala	Tyr	His	Ser	Ser	Leu	260	265	270	
	Ala	Phe	Thr	Ser	Leu	Asn	Cys	Val	Ala	Asp	Pro	Ile	Leu	Tyr	Cys	Leu				

116

	275	280	285
	Val Asn Glu Gly Ala Arg Ser Asp Val Ala Lys Ala Leu His Asn Leu		
	290	295	300
5	Leu Arg Phe Leu Ala Ser Asp Lys Pro Gln Glu Met Ala Asn Ala Ser		
	305	310	315
	Leu Thr Leu Glu Thr Pro Leu Thr Ser Lys Arg Asn Ser Thr Ala Lys		
		325	330
			335
	Ala Met Thr Gly Ser Trp Ala Ala Thr Pro Pro Ser Gln Gly Asp Gln		
		340	345
			350
10	Val Gln Leu Lys Met Leu Pro Pro Ala Gln		
	355	360	
(168) INFORMATION FOR SEQ ID NO:167:			
	(i) SEQUENCE CHARACTERISTICS:		
	(A) LENGTH: 1002 base pairs		
15	(B) TYPE: nucleic acid		
	(C) STRANDEDNESS: single		
	(D) TOPOLOGY: linear		
	(ii) MOLECULE TYPE: DNA (genomic)		
	(xi) SEQUENCE DESCRIPTION: SEQ ID NO:167:		
20	ATGGAGTCCT CAGGCAACCC AGAGAGCACC ACCTTTTTTT ACTATGACCT TCAGAGCCAG	60	
	CCGTGTGAGA ACCAGGCCTG GGTCTTTGCT ACCCTCGCCA CCACTGTCCT GTACTGCCTG	120	
	GTGTTTCTCC TCAGCCTAGT GGGCAACAGC CTGGTCCTGT GGGTCCTGGT GAAGTATGAG	180	
	AGCCTGGAGT CCCTCACCAA CATCTTCATC CTC AACCTGT GCCTCTCAGA CCTGGTGTTC	240	
	GCCTGCTTGT TGCTGTGTG GATCTCCCCA TACCACTGGG GCTGGGTGCT GGGAGACTTC	300	
25	CTCTGCAAC TCCTCAATAT GATCTTCTCC ATCAGCCTCT ACAGCAGCAT CTTCTTCCTG	360	
	ACCATCATGA CCATCCACCG CTACCTGTGG GTAGTGAGCC CCCTCTCCAC CCTGCGCGTC	420	
	CCCACCTCC GCTGCCGGGT GCTGGTGACC ATGGCTGTGT GGGTAGCCAG CATCTGTGCC	480	
	TCCATCCTCG ACACCATCTT CCACAAGGTG CTTTCTTCGG GCTGTGATTA TTCCGAATC	540	
	ACGTGGTIACC TCACCTCCGT CTACCAGCAC AACCTCTTCT TCCTGTGTTC CCTGGGGATT	600	
30	ATCCTGTTCT GCTACGTGGA GATCCTCAGG ACCCTGTGCC GCTCAGCTC CAAGCGGCGC	660	
	CACCGCACGA AAAAGCTCAT CTTGCCCATC GTGGTGGCCT ACTTCCTCAG CTGGGGTCCC	720	
	TACAACTTCA CCCTGTTTCT GCAGACGCTG TTTCGGACCC AGATCATCCG GAGCTGCGAG	780	

117

GCCAAACAGC AGCTAGAATA CGCCCTGCCTC ATCTGCCGCA ACCTCGCCTT CTCCCCTAGC 840
 TGCTTTAACC CGGTGCTCTA TGTCTTCGTG GGGGTCAAGT TCCGCACACA CCTGAAACAT 900
 GTTCTCCGGC AGTTCTGGTT CTGCCGGCTG CAGGCACCCA GCCCAGCCTC GATCCCCCAC 960
 TCCCCTGGTG CCTTCGCCTA TGAGGGCGCC TCCTTCTACT GA 1002

5 (169) INFORMATION FOR SEQ ID NO:168:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 333 amino acids

(B) TYPE: amino acid

(C) STRANDEDNESS:

(D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:168:

Met Glu Ser Ser Gly Asn Pro Glu Ser Thr Thr Phe Phe Tyr Tyr Asp
 1 5 10 15
 15 Leu Gln Ser Gln Pro Cys Glu Asn Gln Ala Trp Val Phe Ala Thr Leu
 20 25 30
 Ala Thr Thr Val Leu Tyr Cys Leu Val Phe Leu Leu Ser Leu Val Gly
 35 40 45
 20 Asn Ser Leu Val Leu Trp Val Leu Val Lys Tyr Glu Ser Leu Glu Ser
 50 55 60
 Leu Thr Asn Ile Phe Ile Leu Asn Leu Cys Leu Ser Asp Leu Val Phe
 65 70 75 80
 Ala Cys Leu Leu Pro Val Trp Ile Ser Pro Tyr His Trp Gly Trp Val
 85 90 95
 25 Leu Gly Asp Phe Leu Cys Lys Leu Leu Asn Met Ile Phe Ser Ile Ser
 100 105 110
 Leu Tyr Ser Ser Ile Phe Phe Leu Thr Ile Met Thr Ile His Arg Tyr
 115 120 125
 30 Leu Ser Val Val Ser Pro Leu Ser Thr Leu Arg Val Pro Thr Leu Arg
 130 135 140
 Cys Arg Val Leu Val Thr Met Ala Val Trp Val Ala Ser Ile Leu Ser
 145 150 155 160
 Ser Ile Leu Asp Thr Ile Phe His Lys Val Leu Ser Ser Gly Cys Asp
 165 170 175
 35 Tyr Ser Glu Leu Thr Trp Tyr Leu Thr Ser Val Tyr Gln His Asn Leu
 180 185 190

118

Phe Phe Leu Leu Ser Leu Gly Ile Ile Leu Phe Cys Tyr Val Glu Ile
 195 200 205
 Leu Arg Thr Leu Phe Arg Ser Arg Ser Lys Arg Arg His Arg Thr Lys
 210 215 220
 5 Lys Leu Ile Phe Ala Ile Val Val Ala Tyr Phe Leu Ser Trp Gly Pro
 225 230 235 240
 Tyr Asn Phe Thr Leu Phe Leu Gln Thr Leu Phe Arg Thr Gln Ile Ile
 245 250 255
 10 Arg Ser Cys Glu Ala Lys Gln Gln Leu Glu Tyr Ala Leu Leu Ile Cys
 260 265 270
 Arg Asn Leu Ala Phe Ser His Cys Cys Phe Asn Pro Val Leu Tyr Val
 275 280 285
 Phe Val Gly Val Lys Phe Arg Thr His Leu Lys His Val Leu Arg Gln
 290 295 300
 15 Phe Trp Phe Cys Arg Leu Gln Ala Pro Ser Pro Ala Ser Ile Pro His
 305 310 315 320
 Ser Pro Gly Ala Phe Ala Tyr Glu Gly Ala Ser Phe Tyr
 325 330

(170) INFORMATION FOR SEQ ID NO:169:

- 20 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 987 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
 25 (ii) MOLECULE TYPE: DNA (genomic)
 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:169:

ATGGACAACG CCTCGTTCTC GGAGCCCTGG CCCGCCAACG CATCGGGCCC GGACCCGGCG 60
 CTGAGCTGCT CCAACGCGTC GACTCTGGCG CGCTGCGCG CGCCGCTGGC GGTGGCTGTA 120
 CCAGTTGTCT ACGCGGTGAT CTGCGCCGTG GGTCTGGCGG GCAACTCCGC CGTGCTGTAC 180
 30 GTGTTGCTGC GGGCGCCCCG CATGAAGACC GTCACCAACC TGTTTCATCT CAACCTGGCC 240
 ATCGCGACG AGCTCTTTCAC GCTGGTGCTG CCCATCAACA TCGCGGACTT CCTGCTGCGG 300
 CAGTGGCCCT TCGGGGAGCT CATGTGCAAG CTCATCGTGG CTATCGACCA GTACAACACC 360
 TTGTCCAGCC TCTACTTCTCT CACCGTCATG AGCGCCGACC GCTACCTGGT GGTGTTGGCC 420
 ACTGCGGAGT CGCGCCGGGT GGCCGCGCGC ACCTACAGCG CCGCGCGCGC GGTGAGCCTG 480

119

GCGGTGTGGG GGATCGTCAC ACTCGTCGTG CTGCCCTTCG CAGTCTTCGC CCGGCTAGAC 540
 GACGAGCAGG GCGGGCGCCA GTGCGTGCTA GTCCTTCCGC AGCCCGAGGC CTTCTGGTGG 600
 CGCGGAGGCC GCCTCTACAC GCTCGTGCTG GGCCTCGCCA TCCCGTGTG CACCATCTGT 660
 GTCCTCTATA CCACCTTGCT GTGCCGGCTG CATGCCATGC GGCTGGACAG CCACGCCAAG 720
 5 GCGCTGGAGC GCGCCAAGAA GCGGGTGAAG TTCCTGGTGG TGGCAATCCT GGCCTGTGTG 780
 CTCCTCTGCT GGAGCGCCTA CCACCTGAGC ACCGTGGTGG CGCTCACCAC CGACCTCCCG 840
 CAGACGCCGC TGGTCATCGC TATCTCCTAC TTCATCACCA GCCTGACGTA CGCCACACGC 900
 TGCTCAACC CCTTCTCTA CGCCTTCCTG GACGCCAGCT TCCGAGGAA CCTCCGCCAG 960
 CTGATAACTT GCGCGCGGCG AGCCTGA 987

10 (171) INFORMATION FOR SEQ ID NO:170:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 328 amino acids
 - (B) TYPE: amino acid
 - (C) STRANDEDNESS:
 - 15 (D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:170:

	Met	Asp	Asn	Ala	Ser	Phe	Ser	Glu	Pro	Trp	Pro	Ala	Asn	Ala	Ser	Gly
	1				5					10					15	
20	Pro	Asp	Pro	Ala	Leu	Ser	Cys	Ser	Asn	Ala	Ser	Thr	Leu	Ala	Pro	Leu
				20					25					30		
	Pro	Ala	Pro	Leu	Ala	Val	Ala	Val	Pro	Val	Val	Tyr	Ala	Val	Ile	Cys
				35				40					45			
25	Ala	Val	Gly	Leu	Ala	Gly	Asn	Ser	Ala	Val	Leu	Tyr	Val	Leu	Leu	Arg
		50				55					60					
	Ala	Pro	Arg	Met	Lys	Thr	Val	Thr	Asn	Leu	Phe	Ile	Leu	Asn	Leu	Ala
	65				70					75				80		
	Ile	Ala	Asp	Glu	Leu	Phe	Thr	Leu	Val	Leu	Pro	Ile	Asn	Ile	Ala	Asp
				85					90					95		
30	Phe	Leu	Leu	Arg	Gln	Trp	Pro	Phe	Gly	Glu	Leu	Met	Cys	Lys	Leu	Ile
				100					105					110		
	Val	Ala	Ile	Asp	Gln	Tyr	Asn	Thr	Phe	Ser	Ser	Leu	Tyr	Phe	Leu	Thr
			115				120						125			
	Val	Met	Ser	Ala	Asp	Arg	Tyr	Leu	Val	Val	Leu	Ala	Thr	Ala	Glu	Ser

120

	130		135		140	
	Arg Arg Val Ala Gly Arg Thr Tyr Ser Ala Ala Arg Ala Val Ser Leu					
	145		150		155	160
5	Ala Val Trp Gly Ile Val Thr Leu Val Val Leu Pro Phe Ala Val Phe					
		165		170		175
	Ala Arg Leu Asp Asp Glu Gln Gly Arg Arg Gln Cys Val Leu Val Phe					
		180		185		190
	Pro Gln Pro Glu Ala Phe Trp Trp Arg Ala Ser Arg Leu Tyr Thr Leu					
		195		200		205
10	Val Leu Gly Phe Ala Ile Pro Val Ser Thr Ile Cys Val Leu Tyr Thr					
		210		215		220
	Thr Leu Leu Cys Arg Leu His Ala Met Arg Leu Asp Ser His Ala Lys					
		225		230		235
	Ala Leu Glu Arg Ala Lys Lys Arg Val Lys Phe Leu Val Val Ala Ile					
15		245		250		255
	Leu Ala Val Cys Leu Leu Cys Trp Thr Pro Tyr His Leu Ser Thr Val					
		260		265		270
	Val Ala Leu Thr Thr Asp Leu Pro Gln Thr Pro Leu Val Ile Ala Ile					
		275		280		285
20	Ser Tyr Phe Ile Thr Ser Leu Thr Tyr Ala Asn Ser Cys Leu Asn Pro					
		290		295		300
	Phe Leu Tyr Ala Phe Leu Asp Ala Ser Phe Arg Arg Asn Leu Arg Gln					
		305		310		315
						320
25	Leu Ile Thr Cys Arg Ala Ala Ala					
		325				

(172) INFORMATION FOR SEQ ID NO:171:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 1002 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: single
 - (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:171:

	ATGCAGGCCG CTGGGCACCC AGAGCCCCCTT GACAGCAGGG GCTCCTTCTC CCTCCCCAGC	60
35	ATGGGTGCCA ACGTCTCTCA GGACAATGGC ACTGGCCACA ATGCCACCTT CTCCGAGCCA	120
	CTGCCGTTC TCTATGTGCT CCTGCCCGCC GTGTACTCCG GGATCTGTGC TGTGGGGCTG	180

ACTGGCAACA CGGCCGTCAT CCTTGTAAATC CTAAGGGCGC CCAAGATGAA GACGGTGACC 240
 AACGTGTTCA TCCTGAACCT GGCCGTCGCC GACGGGCTCT TCACGCTGGT ACTGCCTGTC 300
 AACATCGCGG AGCACCTGCT GCAGTACTGG CCCTTCGGGG AGCTGCTCTG CAAGCTGGTG 360
 CTGGCCGTCG ACCACTACAA CATCTTCTCC AGCATCTACT TCCTAGCCGT GATGAGCGTG 420
 5 GACCATAACC TGGTGGTGTCT GGCCACCGTG AGGTCCC GCCC ACATGCCCTG GCGCACCTAC 480
 CGGGGGGCGA AGGTCCGCGG CCTGTGTGTC TGGCTGGGCG TCACGGTCCT GGTTCGTGCC 540
 TTCTTCTCTT TCGTGGCGT CTACAGCAAC GAGCTGCAGG TCCCAAGCTG TGGGCTGAGC 600
 TTCCCGTGGC CCGAGCAGGT CTGGTCAAG GCCAGCCGTG TCTACACGTT GGTCTGGGCG 660
 TTCGTGTGTC CCGTGTGCAC CATCTGTGTG CTCTACACAG ACCTCCTGCG CAGGCTGCGG 720
 10 GCCGTGCGGC TCCGCTCTGG AGCCAAGGCT CTAGGCAAGG CCAGCGGAA GGTGAAAGTC 780
 CTGCTCTCG TCGTGTGGC CGTGTGCCTC CTCTGCTGGA CGCCCTTCCA CCTGGCTCTT 840
 GTCGTGGCCC TGACCACGGA CCTGCCCCAG ACCCCACTGG TCATCAGTAT GTCCTACGTC 900
 ATCACCAGCC TCACGTACGC CAACTCGTGC CTGAACCCCT TCCTCTACGC CTTTCTAGAT 960
 GACAACTTCC GGAAGAACTT CCGCAGCATA TTGCGGTGCT GA 1002

15 (173) INFORMATION FOR SEQ ID NO:172:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 333 amino acids
 - (B) TYPE: amino acid
 - (C) STRANDEDNESS:
 - (D) TOPOLOGY: not relevant

20

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:172:

Met Gln Ala Ala Gly His Pro Glu Pro Leu Asp Ser Arg Gly Ser Phe
 1 5 10 15
 25 Ser Leu Pro Thr Met Gly Ala Asn Val Ser Gln Asp Asn Gly Thr Gly
 20 25 30
 His Asn Ala Thr Phe Ser Glu Pro Leu Pro Phe Leu Tyr Val Leu Leu
 35 40 45
 30 Pro Ala Val Tyr Ser Gly Ile Cys Ala Val Gly Leu Thr Gly Asn Thr
 50 55 60
 Ala Val Ile Leu Val Ile Leu Arg Ala Pro Lys Met Lys Thr Val Thr
 65 70 75 80

122

	Asn	Val	Phe	Ile	Leu	Asn	Leu	Ala	Val	Ala	Val	Asp	Gly	Leu	Phe	Thr	Leu	
						85						90					95	
	Val	Leu	Pro	Val	Asn	Ile	Ala	Glu	His	Leu	Leu	Gln	Tyr	Trp	Pro	Phe		
				100					105					110				
5	Gly	Glu	Leu	Leu	Cys	Lys	Leu	Val	Leu	Ala	Val	Asp	His	Tyr	Asn	Ile		
				115				120					125					
	Phe	Ser	Ser	Ile	Tyr		Phe	Leu	Ala	Val	Met	Ser	Val	Asp	Arg	Tyr	Leu	
								135					140					
10	Val	Val	Leu	Ala	Thr	Val	Arg	Ser	Arg	His	Met	Pro	Trp	Arg	Thr	Tyr		
						150					155					160		
	Arg	Gly	Ala	Lys	Val	Ala	Ser	Leu	Cys	Val	Trp	Leu	Gly	Val	Thr	Val		
					165					170					175			
	Leu	Val	Leu	Pro	Phe	Phe	Ser	Phe	Ala	Gly	Val	Tyr	Ser	Asn	Glu	Leu		
				180					185					190				
15	Gln	Val	Pro	Ser	Cys	Gly	Leu	Ser	Phe	Pro	Trp	Pro	Glu	Gln	Val	Trp		
				195				200					205					
	Phe	Lys	Ala	Ser	Arg	Val	Tyr	Thr	Leu	Val	Leu	Gly	Phe	Val	Leu	Pro		
							215					220						
20	Val	Cys	Thr	Ile	Cys	Val	Leu	Tyr	Thr	Asp	Leu	Leu	Arg	Arg	Leu	Arg		
						230					235					240		
	Ala	Val	Arg	Leu	Arg	Ser	Gly	Ala	Lys	Ala	Leu	Gly	Lys	Ala	Arg	Arg		
					245					250					255			
	Lys	Val	Lys	Val	Leu	Val	Leu	Val	Val	Leu	Ala	Val	Cys	Leu	Leu	Cys		
				260					265					270				
25	Trp	Thr	Pro	Phe	His	Leu	Ala	Ser	Val	Val	Ala	Leu	Thr	Thr	Asp	Leu		
				275				280					285					
	Pro	Gln	Thr	Pro	Leu	Val	Ile	Ser	Met	Ser	Tyr	Val	Ile	Thr	Ser	Leu		
				290			295					300						
30	Thr	Tyr	Ala	Asn	Ser	Cys	Leu	Asn	Pro	Phe	Leu	Tyr	Ala	Phe	Leu	Asp		
						310					315					320		
	Asp	Asn	Phe	Arg	Lys	Asn	Phe	Arg	Ser	Ile	Leu	Arg	Cys					
					325					330								

(174) INFORMATION FOR SEQ ID NO:173:

35 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 1107 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

{ii} MOLECULE TYPE: DNA (genomic)

{xi} SEQUENCE DESCRIPTION: SEQ ID NO:173:

```

ATGGTCCTTG AGGTGAGTGA CCACCAAGTG CTAAATGACG CCGAGGTTGC CGCCCTCCTG      60
GAGAACTTCA GCTCTTCTTA TGA CTATGGA GAAACGAGA GTGACTCGTG CTGTACCTCC      120
5  CCGCCCTGCC CACAGGACTT CAGCCTGAAC TTCGACCGGG CCTTCTCTGCC AGCCCTCTAC      180
AGCCTCCTCT TTCTGCTGGG GCTGCTGGGC AACGGCGCGG TGGCAGCCGT GCTGCTGAGC      240
CGCGGAGCAG CCCTGAGCAG CACGACACC TTCCTGCTCC ACCTAGCTGT AGCAGACACG      300
CTGCTGGTGC TGACACTGCC GCTCTGGGCA GTGGACGCTG CCGTCCAGTG GGTCTTTGGC      360
TCTGGCCTCT GCAAAGTGGC AGGTGCCCTC TTCAACATCA ACTTCTACGC AGGAGCCCTC      420
10 CTGCTGGCCT GCATCAGCTT TGACCGCTAC CTGAACATAG TTATGCCAC CCAGCTCTAC      480
CGCCGGGGGC CCGCGGCCGC CGTGACCCTC ACCTGCCTGG CTGTCTGGGG GCTCTGCCTG      540
CTTTTCGCCC TCCAGACTT CATCTTCTGT TCGGCCCCAC ACGACGAGCG CCTCAAGCCG      600
ACCCACTGCC AATACAACT CCCACAGGTG GCGCGCACGG CTCTGCGGGT GCTGCAGCTG      660
GTGGCTGGCT TTCTGCTGCC CCGTCTGGTC ATGGCCTACT GCTATGCCCA CATCCTGGCC      720
15 GTGCTGCTGG TTTCAGGGG CCAGCGGCGC CTGCGGGCCA AGCGGCTGGT GGTGGTGGTC      780
GTGGTGGCCT TTGCCCTCTG CTGGACCCCC TATCACCTGG TGGTGTGGT GGACATCCTC      840
ATGGACCTGG GCGCTTTGGC CCGCAACTGT GGCGGAGAAA GCAGGGTAGA CGTGGCCAAG      900
TCGGTCACCT CAGGCTGGG CTACATGCAC TGCTGCCTCA ACCCGTGCT CTATGCCTTT      960
GTAGGGGTCA AGTTCGGGA GCGATGTGG ATGCTGCTCT TCGCCTGGG CTGCCCCAAC      1020
20 CAGAGAGGGC TCCAGAGGCA GCCATCGTCT TCCCGCCGGG ATTCATCTG GTCTGAGACC      1080
TCAGAGGCCT CCTACTCGGG CTGTGA                                     1107

```

{175} INFORMATION FOR SEQ ID NO:174:

{i} SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 368 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: not relevant

{ii} MOLECULE TYPE: protein

{xi} SEQUENCE DESCRIPTION: SEQ ID NO:174:

124

Met Val Leu Glu Val Ser Asp His Gln Val Leu Asn Asp Ala Glu Val
 1 5 10 15

Ala Ala Leu Leu Glu Asn Phe Ser Ser Ser Tyr Asp Tyr Gly Glu Asn
 20 25 30

5 Glu Ser Asp Ser Cys Cys Thr Ser Pro Pro Cys Pro Gln Asp Phe Ser
 35 40 45

Leu Asn Phe Asp Arg Ala Phe Leu Pro Ala Leu Tyr Ser Leu Leu Phe
 50 55 60

10 Leu Leu Gly Leu Leu Gly Asn Gly Ala Val Ala Ala Val Leu Leu Ser
 65 70 75 80

Arg Arg Thr Ala Leu Ser Ser Thr Asp Thr Phe Leu Leu His Leu Ala
 85 90 95

Val Ala Asp Thr Leu Leu Val Leu Thr Leu Pro Leu Trp Ala Val Asp
 100 105 110

15 Ala Ala Val Gln Trp Val Phe Gly Ser Gly Leu Cys Lys Val Ala Gly
 115 120 125

Ala Leu Phe Asn Ile Asn Phe Tyr Ala Gly Ala Leu Leu Ala Cys
 130 135 140

20 Ile Ser Phe Asp Arg Tyr Leu Asn Ile Val His Ala Thr Gln Leu Tyr
 145 150 155 160

Arg Arg Gly Pro Pro Ala Arg Val Thr Leu Thr Cys Leu Ala Val Trp
 165 170 175

Gly Leu Cys Leu Leu Phe Ala Leu Pro Asp Phe Ile Phe Leu Ser Ala
 180 185 190

25 His His Asp Glu Arg Leu Asn Ala Thr His Cys Gln Tyr Asn Phe Pro
 195 200 205

Gln Val Gly Arg Thr Ala Leu Arg Val Leu Gln Leu Val Ala Gly Phe
 210 215 220

30 Leu Leu Pro Leu Leu Val Met Ala Tyr Cys Tyr Ala His Ile Leu Ala
 225 230 235 240

Val Leu Leu Val Ser Arg Gly Gln Arg Arg Leu Arg Ala Lys Arg Leu
 245 250 255

Val Val Val Val Val Val Ala Phe Ala Leu Cys Trp Thr Pro Tyr His
 260 265 270

35 Leu Val Val Leu Val Asp Ile Leu Met Asp Leu Gly Ala Leu Ala Arg
 275 280 285

Asn Cys Gly Arg Glu Ser Arg Val Asp Val Ala Lys Ser Val Thr Ser

125

290 295 300

Gly Leu Gly Tyr Met His Cys Cys Leu Asn Pro Leu Leu Tyr Ala Phe
305 310 315 320

5 Val Gly Val Lys Phe Arg Glu Arg Met Trp Met Leu Leu Leu Arg Leu
325 330 335

Gly Cys Pro Asn Gln Arg Gly Leu Gln Arg Gln Pro Ser Ser Ser Arg
340 345 350

Arg Asp Ser Ser Trp Ser Glu Thr Ser Glu Ala Ser Tyr Ser Gly Leu
355 360 365

10 (176) INFORMATION FOR SEQ ID NO:175:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 1074 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

15 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:175:

ATGGCTGATG ACTATGGCTC TGAATCCACA TCTTCCATGG AAGACTACGT TAACTTCAAC 60

TTCAGTACT TCTACTGTGA GAAAAACAAT GTCAGGCAGT TTGCGAGCCA TTCTCTCCCA 120

20 CCCTTGTA CTGCTGCTGT CATCGTGGGT GCCTTGGGCA ACAGTCTTGT TATCCTTGTC 180

TACTGGTACT GCACAAGAGT GAAGACCATG ACCGACATGT TCCTTTTGAA TTGGCAATT 240

GCTGACCTCC TCTTTCTTGT CACTCTTCCC TTCGGGCA TTGCTGCTGC TGACCAAGTG 300

AAGTCCAGA CCTTCATGTG CAAGGTGGTC AACAGCATGT ACAAGATGAA CTTCTACAGC 360

TGTGTGTGC TGATCATGTG CATCAGCGTG GACAGGTACA TTGCCATTGC CCAGGCCATG 420

25 AGAGCACATA CTTGGAGGGA GAAAGGCTT TTGTACAGCA AAATGGTTG CTTTACCATC 480

TGGGTATTGG CAGCTGCTCT CTGCATCCCA GAAATCTTAT ACAGCCAAAT CAAGGAGGAA 540

TCCGGCATTG CTATCTGCAC CATGTTTAC CCTAGCGATG AGAGCACCAA ACTGAAGTCA 600

GCTGTCTTGA CCCTGAAGGT CATCTGGGG TTCTTCCTTC CCTTCGTGGT CATGGCTTGC 660

TGTATACCA TCATCATTC CACCCTGATA CAAGCCAAGA AGTCTTCCAA GCACAAAGCC 720

30 AAGAAAGTGA CCATCACTGT CCGACCGTC TTTGTCTTGT CTCAGTTTCC CTACAAGTGC 780

ATTTTGTGG TGCAGACCAT TGACGCCTAT GCCATGTTCA TCTCCAAGT TGCCGTTTCC 840

126

ACCAACATTG ACATCTGCTT CCAGGTCACC CAGACCATCG CCTTCTTCCA CAGTTGCCTG 900
 AACCCGTGTC TCTATGTTT TGTGGGTGAG AGATTCCGCC GGGATCTCGT GAAAACCCCTG 960
 AAGAACTTGG GTTGTCATCAG CCGGCCCCAG TGGGTTTCAT TTACAAGGAG AGAGGGAAGC 1020
 TTGAAGCTGT CGTCTATGTT GCTGGAGACA ACCTCAGGAG CACTCTCCCT CTGA 1074

5 (177) INFORMATION FOR SEQ ID NO:176:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 357 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

10

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:176:

Met Ala Asp Asp Tyr Gly Ser Glu Ser Thr Ser Ser Met Glu Asp Tyr
 1 5 10 15

15

Val Asn Phe Asn Phe Thr Asp Phe Tyr Cys Glu Lys Asn Asn Val Arg
 20 25 30

Gln Phe Ala Ser His Phe Leu Pro Pro Leu Tyr Trp Leu Val Phe Ile
 35 40 45

20

Val Gly Ala Leu Gly Asn Ser Leu Val Ile Leu Val Tyr Trp Tyr Cys
 50 55 60

Thr Arg Val Lys Thr Met Thr Asp Met Phe Leu Leu Asn Leu Ala Ile
 65 70 75 80

Ala Asp Leu Leu Phe Leu Val Thr Leu Pro Phe Trp Ala Ile Ala Ala
 85 90 95

25

Ala Asp Gln Trp Lys Phe Gln Thr Phe Met Cys Lys Val Val Asn Ser
 100 105 110

Met Tyr Lys Met Asn Phe Tyr Ser Cys Val Leu Leu Ile Met Cys Ile
 115 120 125

30

Ser Val Asp Arg Tyr Ile Ala Ile Ala Gln Ala Met Arg Ala His Thr
 130 135 140

Trp Arg Glu Lys Arg Leu Leu Tyr Ser Lys Met Val Cys Phe Thr Ile
 145 150 155 160

Trp Val Leu Ala Ala Ala Leu Cys Ile Pro Glu Ile Leu Tyr Ser Gln
 165 170 175

35

Ile Lys Glu Glu Ser Gly Ile Ala Ile Cys Thr Met Val Tyr Pro Ser
 180 185 190

127

Asp Glu Ser Thr Lys Leu Lys Ser Ala Val Leu Thr Leu Lys Val Ile
 195 200 205
 Leu Gly Phe Phe Leu Pro Phe Val Val Met Ala Cys Cys Tyr Thr Ile
 210 215 220
 5 Ile Ile His Thr Leu Ile Gln Ala Lys Lys Ser Ser Lys His Lys Ala
 225 230 235 240
 Lys Lys Val Thr Ile Thr Val Leu Thr Val Phe Val Leu Ser Gln Phe
 245 250 255
 10 Pro Tyr Asn Cys Ile Leu Leu Val Gln Thr Ile Asp Ala Tyr Ala Met
 260 265 270
 Phe Ile Ser Asn Cys Ala Val Ser Thr Asn Ile Asp Ile Cys Phe Gln
 275 280 285
 Val Thr Gln Thr Ile Ala Phe Phe His Ser Cys Leu Asn Pro Val Leu
 290 295 300
 15 Tyr Val Phe Val Gly Glu Arg Phe Arg Arg Asp Leu Val Lys Thr Leu
 305 310 315 320
 Lys Asn Leu Gly Cys Ile Ser Gln Ala Gln Trp Val Ser Phe Thr Arg
 325 330 335
 20 Arg Glu Gly Ser Leu Lys Leu Ser Ser Met Leu Leu Glu Thr Thr Ser
 340 345 350
 Gly Ala Leu Ser Leu
 355

(178) INFORMATION FOR SEQ ID NO:177:

- 25 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 1110 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
 (ii) MOLECULE TYPE: DNA (genomic)
 30 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:177:
 ATGGCCTCAT CGACCACTCG GGGCCCCAGG GTTCTGACT TATTTTCTGG GCTGCCGCCG 60
 GCGGTCACAA CTCGCCCA A CCAGAGCGCA GAGGCCTCG CGGGCAACGG GTCGGTGGCT 120
 GCGCGGACG CTCACGCCG CACGCCCTTC CAGAGCCTGC AGCTGGTGCA TCAGCTGAAG 180
 GGGTGATCG TGCTGCTCTA CAGCGTCGTG GTGGTCGTGG GGCTGGTGGG CAACTGCCTG 240
 35 CTGGTGCTGG TGATCGCGCG GGTGCCGCG CTGCACAACG TGACGAACTT CCTCATCGGC 300

AACCTGGCCT TGTCCGACGT GTCATGTGC ACCGCCTGCG TGCCGCTCAC GCTGGCCTAT 360
 GCCTTCGAGC CACGCGGCTG GGTGTTTCGGC GCGGCGCTGT GCCACCTGGT CTTCTTCCTG 420
 CAGCCGCTCA CGCTCTATGT GTCGGTGTTC ACGCTCACCA CCATCGCAGT GGACCGCTAC 480
 GTCGTGCTGG TGCACCCGCT GAGGCGCGCA TCTCGCTGCG CCTCAGCCTA CGCTGTGCTG 540
 5 GCCATCTGGG CGCTGTCCGC GGTGCTGGCG CTGCCGCCCG CCGTGACAC CTATCACGTG 600
 GAGCTCAAGC CGCAGCAGT GCGCCTCTGC GAGGAGTTCT GGGGCTCCCA GGAGCGCCAG 660
 CGCAGCTCT ACGCCTGGGG GCTGTGCTG GTACCTTACC TGCTCCCTCT GCTGGTCATC 720
 CTCCTGTCTT ACGTCCGGGT GTCAGTGAAG CTCGCAACC GCGTGGTGCC GGGCTGCGTG 780
 ACCCAGAGCC AGGCCGACTG GGACCGCGCT CGGCGCGCGC GCACCAAATG CTTGCTGGTG 840
 10 GTGGTCGTGG TGGTGTTCGC CGTCTGCTGG CTGCCGCTGC ACGTCTTCAA CCTGCTGCGG 900
 GACCTCGACC CCCACGCCAT CGACCTTAC GCCTTTGGG TGGTGCAGCT GCTCTGCCAC 960
 TGGCTCGCCA TGAGTTCCGC CTGCTACAAC CCCTTCATCT ACGCCTGGCT GCACGACAGC 1020
 TTCCGCGAGG AGCTGCGCAA ACTGTGTGTC GCTTGGCCCC GCAAGATAGC CCCCATGGC 1080
 CAGAATATGA CCGTCAGCGT GGTCTCTGA 1110

15 (179) INFORMATION FOR SEQ ID NO:178:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 369 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 20 (D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:178:

Met Ala Ser Ser Thr Thr Arg Gly Pro Arg Val Ser Asp Leu Phe Ser
 1 5 10 15
 25 Gly Leu Pro Pro Ala Val Thr Thr Pro Ala Asn Gln Ser Ala Glu Ala
 20 25 30
 Ser Ala Gly Asn Gly Ser Val Ala Gly Ala Asp Ala Pro Ala Val Thr
 35 40 45
 30 Pro Phe Gln Ser Leu Gln Leu Val His Gln Leu Lys Gly Leu Ile Val
 50 55 60
 Leu Leu Tyr Ser Val Val Val Val Gly Leu Val Gly Asn Cys Leu
 65 70 75 80

129

Leu Val Leu Val Ile Ala Arg Val Pro Arg Leu His Asn Val Thr Asn
 85 90 95
 Phe Leu Ile Gly Asn Leu Ala Leu Ser Asp Val Leu Met Cys Thr Ala
 100 105 110
 5 Cys Val Pro Leu Thr Leu Ala Tyr Ala Phe Glu Pro Arg Gly Trp Val
 115 120 125
 Phe Gly Gly Gly Leu Cys His Leu Val Phe Phe Leu Gln Pro Val Thr
 130 135 140
 10 Val Tyr Val Ser Val Phe Thr Leu Thr Thr Ile Ala Val Asp Arg Tyr
 145 150 155 160
 Val Val Leu Val His Pro Leu Arg Arg Ala Ser Arg Cys Ala Ser Ala
 165 170 175
 Tyr Ala Val Leu Ala Ile Trp Ala Leu Ser Ala Val Leu Ala Leu Pro
 180 185 190
 15 Pro Ala Val His Thr Tyr His Val Glu Leu Lys Pro His Asp Val Arg
 195 200 205
 Leu Cys Glu Glu Phe Trp Gly Ser Gln Glu Arg Gln Arg Gln Leu Tyr
 210 215 220
 20 Ala Trp Gly Leu Leu Leu Val Thr Tyr Leu Leu Pro Leu Leu Val Ile
 225 230 235 240
 Leu Leu Ser Tyr Val Arg Val Ser Val Lys Leu Arg Asn Arg Val Val
 245 250 255
 Pro Gly Cys Val Thr Gln Ser Gln Ala Asp Trp Asp Arg Ala Arg Arg
 260 265 270
 25 Arg Arg Thr Lys Cys Leu Leu Val Val Val Val Val Phe Ala Val
 275 280 285
 Cys Trp Leu Pro Leu His Val Phe Asn Leu Leu Arg Asp Leu Asp Pro
 290 295 300
 30 His Ala Ile Asp Pro Tyr Ala Phe Gly Leu Val Gln Leu Leu Cys His
 305 310 315 320
 Trp Leu Ala Met Ser Ser Ala Cys Tyr Asn Pro Phe Ile Tyr Ala Trp
 325 330 335
 Leu His Asp Ser Phe Arg Glu Glu Leu Arg Lys Leu Leu Val Ala Trp
 340 345 350
 35 Pro Arg Lys Ile Ala Pro His Gly Gln Asn Met Thr Val Ser Val Val
 355 360 365
 Ile

(180) INFORMATION FOR SEQ ID NO:179:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 1083 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:179:

10	ATGGACCCAG AAGAACTTC AGTTTATTTC GATTATTACT ATGCTACGAG CCCAACTCT	60
	GACATCAGGG AGACCCACTC CCATGTTCTC TACACCTCTG TCTTCCTTCC AGTCTTTTAC	120
	ACAGCTGTGT TCCTGACTGG AGTGCTGGGG AACCTGTGTC TCATGGGAGC GTTGCACTTC	180
	AAACCCGACA GCCGAAGACT GATCGACATC TTTATCATCA ATCTGGCTGC CTCTGACTTC	240
	ATTTTCTTTC TCACATTGCC TCTCTGGGTG GATAAAGAAG CATCTCTAGG ACTGTGGAGG	300
15	ACGGGCTCCT TCCTGTGCAA AGGGAGCTCC TACATGATCT CCGTCAATAT GCATGCACT	360
	GTCTCTCTGC TCATTGTCAT GAGTGTGAC CGTACCTGG CCATTGTGTG GCCAGTCGTA	420
	TCCAGGAAT TCAGAAGGAC AGACTGTGCA TATGTAGTCT GTGCCAGCAT CTGCTTTATC	480
	TCCTGCCTGC TGGGGTTGCC TACTCTTCTG TCCAGGGAGC TCACGCTGAT TGATGATAAG	540
	CCATACTGTG CAGAGAAAAA GGCAACTCCA ATTAACTCA TATGGTCCCT GGTGGCCTTA	600
20	ATTTTCACCT TTTTGTGCC TTTGTTGAGC ATTGTGACCT GCTACTGTTG CATTGCAAGG	660
	AAGCTGTGTG CCCATTACCA GCAATCAGGA AAGCACAACA AAAAGCTGAA GAAATCTAAG	720
	AAGATCATCT TTATTGTCGT GGCAGCCTTT CTGTCTCCTT GGCTGCCCTT CAATACTTTC	780
	AAGTTCCTGG CCATTGTCTC TGGGTTGCGG CAAGAACACT ATTTACCCTC AGCTATTCTT	840
	CAGCTTGTA TGGAGGTGAG TGGACCCTTG GCATTTGCCA ACAGCTGTGT CAACCCCTTC	900
25	ATTTACTATA TCTTCGACAG CTACATCCGC CGGGCCATTG TCCACTGCTT GTGCCCTTGC	960
	CTGAAAACT ATGACTTTGG GAGTAGCACT GAGACATCAG ATAGTCACCT CACTAAGGCT	1020
	CTCTCCACCT TCATTATGCG AGAAGATTTT GCCAGGAGGA GGAAGAGGTC TGTGTCACTC	1080
	TAA	1083

(181) INFORMATION FOR SEQ ID NO:180:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 360 amino acids

131

(B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

5 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:180:

```

Met Asp Pro Glu Glu Thr Ser Val Tyr Leu Asp Tyr Tyr Tyr Ala Thr
1          5          10          15

Ser Pro Asn Ser Asp Ile Arg Glu Thr His Ser His Val Pro Tyr Thr
          20          25          30

10 Ser Val Phe Leu Pro Val Phe Tyr Thr Ala Val Phe Leu Thr Gly Val
          35          40          45

Leu Gly Asn Leu Val Leu Met Gly Ala Leu His Phe Lys Pro Gly Ser
          50          55          60

15 Arg Arg Leu Ile Asp Ile Phe Ile Ile Asn Leu Ala Ala Ser Asp Phe
          65          70          75          80

Ile Phe Leu Val Thr Leu Pro Leu Trp Val Asp Lys Glu Ala Ser Leu
          85          90          95

Gly Leu Trp Arg Thr Gly Ser Phe Leu Cys Lys Gly Ser Ser Tyr Met
          100          105          110

20 Ile Ser Val Asn Met His Cys Ser Val Leu Leu Leu Thr Cys Met Ser
          115          120          125

Val Asp Arg Tyr Leu Ala Ile Val Trp Pro Val Val Ser Arg Lys Phe
          130          135          140

25 Arg Arg Thr Asp Cys Ala Tyr Val Val Cys Ala Ser Ile Trp Phe Ile
          145          150          155          160

Ser Cys Leu Leu Gly Leu Pro Thr Leu Leu Ser Arg Glu Leu Thr Leu
          165          170          175

Ile Asp Asp Lys Pro Tyr Cys Ala Glu Lys Lys Ala Thr Pro Ile Lys
          180          185          190

30 Leu Ile Trp Ser Leu Val Ala Leu Ile Phe Thr Phe Phe Val Pro Leu
          195          200          205

Leu Ser Ile Val Thr Cys Tyr Cys Cys Ile Ala Arg Lys Leu Cys Ala
          210          215          220

35 His Tyr Gln Gln Ser Gly Lys His Asn Lys Lys Leu Lys Lys Ser Lys
          225          230          235          240

Lys Ile Ile Phe Ile Val Val Ala Ala Phe Leu Val Ser Trp Leu Pro
          245          250          255

```

132

Phe Asn Thr Phe Lys Phe Leu Ala Ile Val Ser Gly Leu Arg Gln Glu
260 265 270

His Tyr Leu Pro Ser Ala Ile Leu Gln Leu Gly Met Glu Val Ser Gly
275 280 285

5 Pro Leu Ala Phe Ala Asn Ser Cys Val Asn Pro Phe Ile Tyr Tyr Ile
290 295 300

Phe Asp Ser Tyr Ile Arg Arg Ala Ile Val His Cys Leu Cys Pro Cys
305 310 315 320

10 Leu Lys Asn Tyr Asp Phe Gly Ser Ser Thr Glu Thr Ser Asp Ser His
325 330 335

Leu Thr Lys Ala Leu Ser Thr Phe Ile His Ala Glu Asp Phe Ala Arg
340 345 350

Arg Arg Lys Arg Ser Val Ser Leu
355 360

15 (182) INFORMATION FOR SEQ ID NO:181:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 1020 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 20 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:181:

ATGAATGGCC TTGAAGTGGC TCCCCAGGT CTGATCACCA ACTTCTCCCT GGCCACGGCA 60

GAGCAATGTG GCCAGGAGAC GCCACTGGAG AACATGCTGT TCGCCTCCTT CTACCTTCTG 120

25 GATTTTATCC TGGCTTAGT TGGCAATACC CTGGCTCTGT GGCTTTTCAT CCGAGACCAC 180

AAGTCCGGGA CCCCGGCCAA CGTGTTCCTG ATGCATCTGG CCGTGGCCGA CTTGTCTGTC 240

GTGCTGGTCC TGCCCCACCG CCTGGTCTAC CACTTCTCTG GGAACCACTG GCCATTGGGG 300

GAAATCGCAT GCCGCTCTAC CGGCTTCCTC TTCTACCTCA ACATGTACGC CAGCATCTAC 360

TTCTCTACCT GCATCAGCGC CGACCGTTTC CTGGCCATTG TGCACCCGGT CAAGTCCCTC 420

30 AAGCTCCGCA GGCCCCCTCA CGCACACCTG GCCTGTGCCT TCCTGTGGGT GGTGGTGGCT 480

GTGGCCATGG CCCCGCTGCT GGTGAGCCCA CAGACCGTGC AGACCAACCA CACGGTGGTC 540

TGCTCTCAGC TGTACCGGGA GAAGGCCCTC CACCATGCCC TGCTGTCCCTT GGCAGTGGCC 600

TTACACTTCC CGTTCACTAC CACGGTCACC TGCTACCTGC TGATCATCCG CAGCCTGGCG 660

133

CAGGCGCTGC GTGTGGAGAA GCGCCTCAAG ACCAAGGCAA AACGCATGAT CGCCATAGTG 720
 CTGGCCATCT TCCTGGTCTG CTTCGTGCCC TACCACGTCA ACCGCTCCGT CTACGTGCTG 780
 CACTACCGCA GCCATGGGGC CTCCTGCGCC ACCCAGCGCA TCCTGGCCCT GGCAAACCGC 840
 ATCACCTCCT GCCTCACCAG CCTCAACGGG GCACTCGACC CCATCATGTA TTTCCTCGTG 900
 5 GCTGAGAAGT TCCGCCACGC CCTGTGCAAC TTGCTCTGTG GCAAAGGCT CAAGGGCCCG 960
 CCCCCAGCT TCGAAGGGAA AACCAACGAG AGCTCGCTGA GTGCCAAGTC AGAGCTGTGA 1020

(183) INFORMATION FOR SEQ ID NO:182:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 339 amino acids

(B) TYPE: amino acid

(C) STRANDEDNESS:

(D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:182:

Met Asn Gly Leu Glu Val Ala Pro Pro Gly Leu Ile Thr Asn Phe Ser
 1 5 10 15

Leu Ala Thr Ala Glu Gln Cys Gly Gln Glu Thr Pro Leu Glu Asn Met
 20 25 30

Leu Phe Ala Ser Phe Tyr Leu Leu Asp Phe Ile Leu Ala Leu Val Gly
 35 40 45

Asn Thr Leu Ala Leu Trp Leu Phe Ile Arg Asp His Lys Ser Gly Thr
 50 55 60

Pro Ala Asn Val Phe Leu Met His Leu Ala Val Ala Asp Leu Ser Cys
 65 70 75 80

Val Leu Val Leu Pro Thr Arg Leu Val Tyr His Phe Ser Gly Asn His
 85 90 95

Trp Pro Phe Gly Glu Ile Ala Cys Arg Leu Thr Gly Phe Leu Phe Tyr
 100 105 110

Leu Asn Met Tyr Ala Ser Ile Tyr Phe Leu Thr Cys Ile Ser Ala Asp
 115 120 125

Arg Phe Leu Ala Ile Val His Pro Val Lys Ser Leu Lys Leu Arg Arg
 130 135 140

Pro Leu Tyr Ala His Leu Ala Cys Ala Phe Leu Trp Val Val Val Ala
 145 150 155 160

Val Ala Met Ala Pro Leu Leu Val Ser Pro Gln Thr Val Gln Thr Asn

134

	165	170	175
	His Thr Val Val Cys Leu Gln Leu Tyr Arg Glu Lys Ala Ser His His		
	180	185	190
5	Ala Leu Val Ser Leu Ala Val Ala Phe Thr Phe Pro Phe Ile Thr Thr		
	195	200	205
	Val Thr Cys Tyr Leu Leu Ile Ile Arg Ser Leu Arg Gln Gly Leu Arg		
	210	215	220
	Val Glu Lys Arg Leu Lys Thr Lys Ala Lys Arg Met Ile Ala Ile Val		
	225	230	235
10	Leu Ala Ile Phe Leu Val Cys Phe Val Pro Tyr His Val Asn Arg Ser		
	245	250	255
	Val Tyr Val Leu His Tyr Arg Ser His Gly Ala Ser Cys Ala Thr Gln		
	260	265	270
15	Arg Ile Leu Ala Leu Ala Asn Arg Ile Thr Ser Cys Leu Thr Ser Leu		
	275	280	285
	Asn Gly Ala Leu Asp Pro Ile Met Tyr Phe Phe Val Ala Glu Lys Phe		
	290	295	300
	Arg His Ala Leu Cys Asn Leu Leu Cys Gly Lys Arg Leu Lys Gly Pro		
	305	310	315
20	Pro Pro Ser Phe Glu Gly Lys Thr Asn Glu Ser Ser Leu Ser Ala Lys		
	325	330	335
	Ser Glu Leu		

(183) INFORMATION FOR SEQ ID NO:183:

- 25 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 996 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- 30 (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:183:

ATGATCACCC	TGAACAATCA	AGATCAACCT	GTCCCTTTTA	ACAGCTCACA	TCCAGATGAA	60
TACAAAATG	CAGCCCTTGT	CTTCTATAGC	TGTATCTTCA	TAATTGGATT	ATTGTGTTAC	120
ATCACTGCAT	TATGGGTTTT	CAGTTGTACC	ACCAAGAAGA	GAACCACGGT	AACCATCTAT	180
ATGATGAATG	TGGCATTAGT	GGAATTGATA	TTTATAATGA	CTTACCCTT	TCGAATGTTT	240

TATTATGCAA AAGATGAATG GCCATTGGA GAGTACTTCT GCCAGATTCT TGGAGCTCTC 300
 ACAGTGTTTT ACCCAAGCAT TGCTTTATGG CTTCTTGCCT TTATTAGTGC TGACAGATAC 360
 ATGGCCATTG TACAGCCGAA GTACGCCAAA GAACCTAAAA ACACGTGCAA AGCCGTGCTG 420
 GCGTGTGTGG GAGTCTGGAT AATGACCCTG ACCACGACCA CCCCTCTGCT ACTGCTCTAT 480
 5 AAAGACCCAG ATAAAGACTC CACTCCCGCC ACCTGCCTCA AGATTCTTGA CATCATCTAT 540
 CTAAAGCTG TGAACGTGCT GAACCTCACT CGACTGACAT TTTTTCCTT GATTCTTTG 600
 TTCATCATGA TTGGGTGCTA CTGTGTCATT ATTCATAATC TCCTTCACGG CAGGACGTCT 660
 AAGCTGAAAC CCAAAGTCAA GGAGAAGTCC AAAAGGATCA TCATCAGCCT GCTGGTGCAG 720
 GTGTCGTCT GCTTTATGCC CTTCCACATC TGTTCGCTT TCCTGATGCT GGGAACGGGG 780
 10 GAGAATAGTT ACAATCCCTG GGGAGCCTT ACCACCTTC TCATGAACCT CAGCAGGTG 840
 CTGGATGTA TTCTCTACTA CATCGTTTCA AAACAATTC AGGCTCGAGT CATTAGTGTC 900
 ATGTATACC GTAATTACCT TCGAAGCATG CGCAGAAAAA GTTCCGATC TGSTAGTCTA 960
 AGGTCACTAA GCAATATAAA CAGTGAAATG TTATGA 996

(185) INFORMATION FOR SEQ ID NO:184:

- 15 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 331 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant
- 20 (ii) MOLECULE TYPE: protein
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:184:
- | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Ile | Thr | Leu | Asn | Asn | Gln | Asp | Gln | Pro | Val | Pro | Phe | Asn | Ser | Ser |
| 1 | | | | 5 | | | | 10 | | | | | 15 | | |
| His | Pro | Asp | Glu | Tyr | Lys | Ile | Ala | Ala | Leu | Val | Phe | Tyr | Ser | Cys | Ile |
| 25 | | | 20 | | | | 25 | | | | | 30 | | | |
| Phe | Ile | Ile | Gly | Leu | Phe | Val | Asn | Ile | Thr | Ala | Leu | Trp | Val | Phe | Ser |
| | | 35 | | | | 40 | | | | | 45 | | | | |
| Cys | Thr | Thr | Lys | Lys | Arg | Thr | Thr | Val | Thr | Ile | Tyr | Met | Met | Asn | Val |
| | | 50 | | | 55 | | | | | 60 | | | | | |
| Ala | Leu | Val | Asp | Leu | Ile | Phe | Ile | Met | Thr | Leu | Pro | Phe | Arg | Met | Phe |
| 65 | | | | 70 | | | | | 75 | | | | | 80 | |
| Tyr | Tyr | Ala | Lys | Asp | Glu | Trp | Pro | Phe | Gly | Glu | Tyr | Phe | Cys | Gln | Ile |
| | | | 85 | | | | | | 90 | | | | | 95 | |

136

Leu Gly Ala Leu Thr Val Phe Tyr Pro Ser Ile Ala Leu Trp Leu Leu
 100 105 110

Ala Phe Ile Ser Ala Asp Arg Tyr Met Ala Ile Val Gln Pro Lys Tyr
 115 120 125

5 Ala Lys Glu Leu Lys Asn Thr Cys Lys Ala Val Leu Ala Cys Val Gly
 130 135 140

Val Trp Ile Met Thr Leu Thr Thr Thr Thr Pro Leu Leu Leu Tyr
 145 150 155 160

10 Lys Asp Pro Asp Lys Asp Ser Thr Pro Ala Thr Cys Leu Lys Ile Ser
 165 170 175

Asp Ile Ile Tyr Leu Lys Ala Val Asn Val Leu Asn Leu Thr Arg Leu
 180 185 190

Thr Phe Phe Phe Leu Ile Pro Leu Phe Ile Met Ile Gly Cys Tyr Leu
 195 200 205

15 Val Ile Ile His Asn Leu Leu His Gly Arg Thr Ser Lys Leu Lys Pro
 210 215 220

Lys Val Lys Glu Lys Ser Lys Arg Ile Ile Ile Thr Leu Leu Val Gln
 225 230 235 240

20 Val Leu Val Cys Phe Met Pro Phe His Ile Cys Phe Ala Phe Leu Met
 245 250 255

Leu Gly Thr Gly Glu Asn Ser Tyr Asn Pro Trp Gly Ala Phe Thr Thr
 260 265 270

Phe Leu Met Asn Leu Ser Thr Cys Leu Asp Val Ile Leu Tyr Tyr Ile
 275 280 285

25 Val Ser Lys Gln Phe Gln Ala Arg Val Ile Ser Val Met Leu Tyr Arg
 290 295 300

Asn Tyr Leu Arg Ser Met Arg Arg Lys Ser Phe Arg Ser Gly Ser Leu
 305 310 315 320

30 Arg Ser Leu Ser Asn Ile Asn Ser Glu Met Leu
 325 330

(186) INFORMATION FOR SEQ ID NO:185:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 1077 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: single
 - (D) TOPOLOGY: linear
- 35
- (ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:185:

ATGCCCTCTG TGTCTCCAGC GGGGCCCTCG GCCGGGGCAG TCCCAATGC CACCGCAGTG 60
 AACACAGTGC GGACCAATGC CAGCGGGCTG GAGGTGCCCC TGTTCCACCT GTTGTCCCGG 120
 CTGGACGAGG AGCTGCATGG CACCTTCCCA GGCCTGTGCG TGGCGCTGAT GGCGBTGCAC 180
 5 GGAGCCATCT TCCTGGCAGG GCTGGTGTCT AACGGGCTGG CGTGTACGT CTCTGTCTGC 240
 CGCACCCGGG CCAAGACACC CTCAGTCATC TACACCATCA ACCTGGTGGT GACCGATCTA 300
 CTGGTAGGGC TGTCCCTGCC CACGCGCTTC GCTGTGTACT ACGGCGCCAG GGGCTGCCTG 360
 CGCTGTGCCT TCCGCGACGT CCTCGGTTAC TTCCTCAACA TGCATGCTC CATCCTCTTC 420
 CTCACCTGCA TCTGCGTGA CCGCTACCTG GCCATCGTGC GGCCCGAAGG TCCCGCGCGC 480
 10 TGCCGCCAGC CTGCTGTGC CAGGGCCGTG TGCGCCTTCG TGTGGCTGGC CGCCGGTGCC 540
 GTCACCTGT CGTGTCTGGG CGTGACAGGC AGCCGGCCCT GCTGCGGTGT CTTTGTGCTG 600
 ACTGTCTGG AGTTCTGTCT GCCCTGTCTG GTCATCAGCG TGTTTACCGG CCGCATCATG 660
 TGTGCACTGT CGCGGCCGGG TCTGCTCCAC CAGGGTCGCC AGCGCCGCGT GCGGGCCAA 720
 CAGCTCCTGC TCACGGTGTCT CATCATCTTT CTCGTCTGCT TCACGCCCTT CCACGCCCGC 780
 15 CAAGTGGCCG TGGCGCTGTG GCCCGACATG CCACACCACA CGAGCCTCGT GGTCTACCAC 840
 GTGGCCGTGA CCCTCAGCAG CCTCAACAGC TGCATGGACC CCATCGTCTA CTGCTTCGTC 900
 ACCAGTGGCT TCCAGGCCAC CGTCCGAGGC CTCTTCGGCC AGCACGGAGA GCGTGAGCCC 960
 AGCAGCGGTG ACGTGGTCAG CATGCACAGG AGCTCCAAGG GCTCAGGCCG TCATCACATC 1020
 CTCAGTGCCG GCCCTCAGC CCTACCCAG GCCCTGGCTA ATGGGCCCGA GGCCTAG 1077

20 (187) INFORMATION FOR SEQ ID NO:186:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 358 amino acids

(B) TYPE: amino acid

(C) STRANDEDNESS:

(D) TOPOLOGY: not relevant

25

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:186:

Met Pro Ser Val Ser Pro Ala Gly Pro Ser Ala Gly Ala Val Pro Asn
 1 5 10 15

30 Ala Thr Ala Val Thr Thr Val Arg Thr Asn Ala Ser Gly Leu Glu Val
 20 25 30

138

Pro Leu Phe His Leu Phe Ala Arg Leu Asp Glu Glu Leu His Gly Thr
 35 40 45
 Phe Pro Gly Leu Cys Val Ala Leu Met Ala Val His Gly Ala Ile Phe
 50 55 60
 5 Leu Ala Gly Leu Val Leu Asn Gly Leu Ala Leu Tyr Val Phe Cys Cys
 65 70 75 80
 Arg Thr Arg Ala Lys Thr Pro Ser Val Ile Tyr Thr Ile Asn Leu Val
 85 90 95
 10 Val Thr Asp Leu Leu Val Gly Leu Ser Leu Pro Thr Arg Phe Ala Val
 100 105 110
 Tyr Tyr Gly Ala Arg Gly Cys Leu Arg Cys Ala Phe Pro His Val Leu
 115 120 125
 Gly Tyr Phe Leu Asn Met His Cys Ser Ile Leu Phe Leu Thr Cys Ile
 130 135 140
 15 Cys Val Asp Arg Tyr Leu Ala Ile Val Arg Pro Glu Gly Ser Arg Ala
 145 150 155 160
 Cys Arg Gln Pro Ala Cys Ala Arg Ala Val Cys Ala Phe Val Trp Leu
 165 170 175
 20 Ala Ala Gly Ala Val Thr Leu Ser Val Leu Gly Val Thr Gly Ser Arg
 180 185 190
 Pro Cys Cys Arg Val Phe Ala Leu Thr Val Leu Glu Phe Leu Leu Pro
 195 200 205
 Leu Leu Val Ile Ser Val Phe Thr Gly Arg Ile Met Cys Ala Leu Ser
 210 215 220
 25 Arg Pro Gly Leu Leu His Gln Gly Arg Gln Arg Arg Val Arg Ala Lys
 225 230 235 240
 Gln Leu Leu Leu Thr Val Leu Ile Ile Phe Leu Val Cys Phe Thr Pro
 245 250 255
 30 Phe His Ala Arg Gln Val Ala Val Ala Leu Trp Pro Asp Met Pro His
 260 265 270
 His Thr Ser Leu Val Val Tyr His Val Ala Val Thr Leu Ser Ser Leu
 275 280 285
 Asn Ser Cys Met Asp Pro Ile Val Tyr Cys Phe Val Thr Ser Gly Phe
 290 295 300
 35 Gln Ala Thr Val Arg Gly Leu Phe Gly Gln His Gly Glu Arg Glu Pro
 305 310 315 320
 Ser Ser Gly Asp Val Val Ser Met His Arg Ser Ser Lys Gly Ser Gly

325 330 335

Arg His His Ile Leu Ser Ala Gly Pro His Ala Leu Thr Gln Ala Leu
340 345 350

Ala Asn Gly Pro Glu Ala
355

5 (188) INFORMATION FOR SEQ ID NO:187:

(i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 1050 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

10 (ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:187:

ATGAACCTCCA CCTTGGATGG TAATCAGAGC AGCCACCCTT TTTGCCTCTT GGCATTTTGGC 60

15 TATTTTGGAAA CTGTCAATTT TTGCCTTTTG GAAGTATTGA TTATGTCTT TCTAACTGTA 120

TTGATTATTT CTGGCAACAT CATTTGTATT TTTGTATTCT ACTGTGCACC TTTGTGTAAC 180

CATCACACTA CAAGTTATTT TATCCAGACT ATGGCATATG CTGACCTTTT TGTTTGGGGTG 240

AGCTGCGTGG TCCCTCTCTT ATCACTCCTC CATCACCCCC TTCCAGTAGA GGAGTCTTTG 300

ACTTGCCAGA TATTTGTTT TGTAGTATCA GTTCTGAAGA GCGTCTCCAT GGCTTCTCTG 360

20 GCCTGTATCA GCATTGATAG ATACATTGCC ATTACTAAAC CTTTAACCTA TAATACTCTG 420

GTTACACCCT GGAGACTACG CCTGTGTATT TTCCTGATT GGCTATACTC GACCCTGGTC 480

TTCTGCCTT CCTTTTCCA CTGGGGCAA CCTGGATATC ATGGAGATGT GTTTCAGTGG 540

TGTGCGGAGT CCTGGCACAC CGACTCCTAC TTCACCCTGT TCATCGTGAT GATGTTTATAT 600

GCCCCAGCAG CCCTTATTGT CTGCTTCACC TATTTCAACA TCTTCCGAT TGCCCAACAG 660

25 CACACAAGG ATATCAGCGA AAGGCAAGCC CGCTTCAGCA GCCAGAGTGG GGAGACTGGG 720

GAAGTGCAGG CCTGCTCTGA TAAGCGCTAT AAAATGGTCC TGTTCGAAT CACTAGTGTGA 780

TTTTCATATC TCTGGTTGCC ATATATCATC TACTTCTTGT TGGAAAGCTC CACTGGCCAC 840

AGCAACCGCT TCGATCCTT CTTGACCACC TGGCTTGCTA TTAGTAACAG TTTCTGCAAC 900

TGTGTAATTT ATAGTCTCTC CAACAGTGTA TTCCAAAGAG GACTAAAGCG CCTCTCAGGG 960

30 GCTATGTGTA CTCTTGTGTC AAGTCAGACT ACAGCCAACG ACCCTTACAC AGTTAGAAGC 1020

AAAGGCCCTC TTAATGGATG TCATATCTGA 1050

(189) INFORMATION FOR SEQ ID NO:188:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 349 amino acids

(B) TYPE: amino acid

(C) STRANDEDNESS:

(D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:188:

```

5      Met Asn Ser Thr Leu Asp Gly Asn Gln Ser Ser His Pro Phe Cys Leu
      1              5              10              15

10     Leu Ala Phe Gly Tyr Leu Glu Thr Val Asn Phe Cys Leu Leu Glu Val
      20              25              30

      Leu Ile Ile Val Phe Leu Thr Val Leu Ile Ile Ser Gly Asn Ile Ile
      35              40              45

15     Val Ile Phe Val Phe His Cys Ala Pro Leu Leu Asn His His Thr Thr
      50              55              60

      Ser Tyr Phe Ile Gln Thr Met Ala Tyr Ala Asp Leu Phe Val Gly Val
      65              70              75              80

20     Ser Cys Val Val Pro Ser Leu Ser Leu Leu His His Pro Leu Pro Val
      85              90              95

      Glu Glu Ser Leu Thr Cys Gln Ile Phe Gly Phe Val Val Ser Val Leu
      100             105             110

      Lys Ser Val Ser Met Ala Ser Leu Ala Cys Ile Ser Ile Asp Arg Tyr
      115             120             125

25     Ile Ala Ile Thr Lys Pro Leu Thr Tyr Asn Thr Leu Val Thr Pro Trp
      130             135             140

      Arg Leu Arg Leu Cys Ile Phe Leu Ile Trp Leu Tyr Ser Thr Leu Val
      145             150             155             160

30     Phe Leu Pro Ser Phe Phe His Trp Gly Lys Pro Gly Tyr His Gly Asp
      165             170             175

      Val Phe Gln Trp Cys Ala Glu Ser Trp His Thr Asp Ser Tyr Phe Thr
      180             185             190

      Leu Phe Ile Val Met Met Leu Tyr Ala Pro Ala Ala Leu Ile Val Cys
      195             200             205

35     Phe Thr Tyr Phe Asn Ile Phe Arg Ile Cys Gln Gln His Thr Lys Asp
      210             215             220

```

141

Ile Ser Glu Arg Gln Ala Arg Phe Ser Ser Gln Ser Gly Glu Thr Gly
 225 230 235 240

Glu Val Gln Ala Cys Pro Asp Lys Arg Tyr Lys Met Val Leu Phe Arg
 245 250 255

5 Ile Thr Ser Val Phe Tyr Ile Leu Trp Leu Pro Tyr Ile Ile Tyr Phe
 260 265 270

Leu Leu Glu Ser Ser Thr Gly His Ser Asn Arg Phe Ala Ser Phe Leu
 275 280 285

10 Thr Thr Trp Leu Ala Ile Ser Asn Ser Phe Cys Asn Cys Val Ile Tyr
 290 295 300

Ser Leu Ser Asn Ser Val Phe Gln Arg Gly Leu Lys Arg Leu Ser Gly
 305 310 315 320

Ala Met Cys Thr Ser Cys Ala Ser Gln Thr Thr Ala Asn Asp Pro Tyr
 325 330 335

15 Thr Val Arg Ser Lys Gly Pro Leu Asn Gly Cys His Ile
 340 345

(190) INFORMATION FOR SEQ ID NO:189:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 1302 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:189:
- 25 ATGTGTTTT CTCCATTCT GGAAATCAAC ATGCGAGTCG AATCTAACAT TACAGTSCGA 60
- GATGACATTG ATGACATCAA CACCAATATG TACCAACCAC TATCATATCC GTTAAGCTTT 120
- CAAGTGCTC TCACCGGATT TCTTATGTTA GAAATTGTGT TGGGACTTGG CAGCAACCTC 180
- ACTGTATTGG TACTTTACTG CATGAAATCC AACTTAATCA ACTCTGTCAG TAACAATTAT 240
- ACAATGAATC TTCATGTACT TGATGTAATA ATTTGTGTGG GATGTATTCC TCTAACTATA 300
- 30 GTTATCCTTC TGCTTTCACT GGAGAGTAAC ACTGCTCTCA TTTGCTGTTT CCATGAGGCT 360
- TGTGTATCTT TTGCAAGTGT CTCACACGCA ATCAACGTTT TTGCTATCAC TTTGGACAGA 420
- TATGACATCT CTGTAAACCC TGCAAAACCGA ATTCTGACAA TGGGCAGAGC TGTAATGTTA 480
- ATGATATCCA TTTGGATTTT TTCTTTTTTC TCTTTCCTGA TTCCTTTTAT TGAGGTAAT 540
- TTTTTCAGTC TTCAAAGTGG AAATACCTGG GAAAACAAGA CACTTTTATG TGTCAGTACA 600

142

AATGAATACT ACACTGAACT GGGAATGTAT TATCACCTGT TAGTACAGAT CCCAATATTC 660
 TTTTTCACCTG TTGTAGTART GTTAATCACA TACACCAAAA TACTTCAGGC TCTTAATATT 720
 CGAATAGGCA CAAGATTTC AACAGGGCAG AAGAAGAAAG CAAGAAAGAA AAAGACAATT 780
 TCTCTAACCA CACAACATGA GGCTACAGAC ATGTCACAAA CGAGTGGTGG GAGAAATGTA 840
 5 GTCTTTGGTG TAAGAACTTC AGTTTCTGTA ATAATTGCCC TCCGGCGAGC TGTGAAACGA 900
 CACCGTAGAC GACGAGAAAG ACAAAGAGA GTCAGAGGA TGTCTTTATT GATTATTCT 960
 ACATTTCCTC TCTGCTGGAC ACCAATTCT GTTTTAAATA CCACCATTT ATGTTTAGGC 1020
 CCAAGTGACC TTTTAGTAAA ATTAAGATTG TGTTTTTTAG TCATGGCTTA TGGAACTACT 1080
 ATATTTCACC CTCTATTATA TGCATTCAC AGACAAAAAT TTCAAAAGGT CTTGAAAAGT 1140
 10 AAAATGAAAA AGCGAGTGT TTCTATAGTA GAAGCTGATC CCCTGCCTAA TAATGCTGTA 1200
 ATACACAACCT CTTGGATAGA TCCCAAGA AACAAAAA TTACCTTTGA AGATAGTGAA 1260
 ATAAGAGAAA AACGTTTAGT GCCTCAGGTT GTCACAGACT AG 1302

(191) INFORMATION FOR SEQ ID NO:190:

- 15 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 433 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

- 20 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:190:

Met Cys Phe Ser Pro Ile Leu Glu Ile Asn Met Gln Ser Glu Ser Asn
 1 5 10 15
 Ile Thr Val Arg Asp Asp Ile Asp Asp Ile Asn Thr Asn Met Tyr Gln
 20 25 30
 25 Pro Leu Ser Tyr Pro Leu Ser Phe Gln Val Ser Leu Thr Gly Phe Leu
 35 40 45
 Met Leu Glu Ile Val Leu Gly Leu Gly Ser Asn Leu Thr Val Leu Val
 50 55 60
 30 Leu Tyr Cys Met Lys Ser Asn Leu Ile Asn Ser Val Ser Asn Ile Ile
 65 70 75 80
 Thr Met Asn Leu His Val Leu Asp Val Ile Ile Cys Val Gly Cys Ile
 85 90 95
 Pro Leu Thr Ile Val Ile Leu Leu Leu Ser Leu Glu Ser Asn Thr Ala

143

	100	105	110
	Leu Ile Cys Cys Phe His Glu 115	Ala Cys Val Ser Phe 120	Ala Ser Val Ser 125
5	Thr Ala Ile Asn Val Phe Ala 130	Ile Thr Leu Asp Arg 135	Tyr Asp Ile Ser 140
	Val Lys Pro Ala Asn Arg Ile 145	Leu Thr Met Gly Arg Ala 150	Val Met Leu 155 160
	Met Ile Ser Ile Trp Ile Phe Ser 165	Phe Phe Ser Phe 170	Leu Ile Pro Phe 175
10	Ile Glu Val Asn Phe Phe Ser 180	Leu Gln Ser Gly Asn Thr 185	Trp Glu Asn 190
	Lys Thr Leu Leu Cys Val Ser 195	Thr Asn Glu Tyr Tyr 200	Thr Glu Leu Gly 205
15	Met Tyr Tyr His Leu Leu Val 210	Gln Ile Pro Ile Phe Phe 215	Phe Thr Val 220
	Val Val Met Leu Ile Thr Tyr Thr 225	Lys Ile Leu Gln Ala Leu 230	Asn Ile 235 240
	Arg Ile Gly Thr Arg Phe Ser 245	Thr Gly Gln Lys Lys 250	Lys Ala Arg Lys 255
20	Lys Lys Thr Ile Ser Leu Thr 260	Thr Gln His Glu Ala Thr 265	Asp Met Ser 270
	Gln Ser Ser Gly Gly Arg Asn 275	Val Val Phe Gly Val Arg 280	Thr Ser Val 285
25	Ser Val Ile Ile Ala Leu Arg 290	Arg Ala Val Lys Arg His 295	Arg Glu Arg 300
	Arg Glu Arg Gln Lys Arg Val 305	Lys Arg Met Ser Leu Leu 310	Ile Ile Ser 315 320
	Thr Phe Leu Leu Cys Trp Thr 325	Pro Ile Ser Val Leu Asn 330	Thr Thr Ile 335
30	Leu Cys Leu Gly Pro Ser Asp 340	Leu Leu Val Lys Leu Arg 345	Leu Cys Phe 350
	Leu Val Met Ala Tyr Gly Thr 355	Thr Ile Phe His Pro Leu 360	Leu Tyr Ala 365
35	Phe Thr Arg Gln Lys Phe Gln 370	Lys Val Leu Lys Ser 375	Lys Met Lys Lys 380
	Arg Val Val Ser Ile Val Glu 385	Ala Asp Pro Leu Pro Asn 390	Asn Ala Val 395 400

144

Ile His Asn Ser Trp Ile Asp Pro Lys Arg Asn Lys Lys Ile Thr Phe
405 410 415

Glu Asp Ser Glu Ile Arg Glu Lys Arg Leu Val Pro Gln Val Val Thr
420 425 430

5 Asp

(192) INFORMATION FOR SEQ ID NO:191:

(i) SEQUENCE CHARACTERISTICS:
10 (A) LENGTH: 1209 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:191:

15 ATGTTGTGTC CTTCCAAGAC AGATGGCTCA GGGCACTCTG GTAGGATTCA CCAGGAAACT 60
CATGGAGAAG GGAAAAGGGA CAAGATTAGC AACAGTGAAG GGAGGGAGAA TGGTGGGAGA 120
GGATTCCAGA TGAACGGTGG GTCGCTGGAG GCTGAGCATG CCAGCAGGAT GTCAGTTCTC 180
AGAGCAAAGC CCATGTCAA CAGCCAACGC TTGCTCCTTC TGTCCTCCAGG ATCACCTCCT 240
CGCACGGGGA GCATCTCCTA CATCAACATC ATCATGCCTT CGGTGTTGCG CACCATCTGC 300
20 CTCCTGGGCA TCATCGGGAA CTCCACGGTC ATCTTCGCGG TCGTGAAGAA GTCCAAGCTG 360
CACTGGTGCA ACAACGTCCC CGACATCTTC ATCATCAACC TCTCGGTAGT AGATCTCCTC 420
TTTCTCCTGG GCATGCCCTT CATGATCCAC CAGCTCATGG GCAATGGGGT GTGGCACTTT 480
GGGGAGACCA TGTGCACCTT CATCACGGCC ATGGATGCCA ATAGTCAGTT CACCAGCACC 540
TACATCCTGA CCGCCATGGC CATTGACCGC TACCTGGCCA CTGTCCACCC CATCTCTTCC 600
25 ACGAAGTTCC GGAAGCCCTC TGTGGCCACC CTGGTGATCT GCCTCTCTGT GGCCCTCTCC 660
TTCATCAGCA TCACCCCTGT GTGGCTGTAT GCCAGACTCA TCCCCTTCCC AGGAGGTGCA 720
GTGGGCTGCG GCATACGCCT GCCCAACCCA GACACTGACC TCTACTGGTT CACCCTGTAC 780
CAGITTTTCC TGGCCTTTGC CCTGCCTTTT GTGGTCATCA CAGCCGCATA CGTAGGATC 840
CTGCAGCGCA TGACGTCCTC AGTGGCCCCC GCCTCCGAGC GCAGCATCCG GCTGCGGACA 900
30 AAGAGGGTGA AACGCACAGC CATCGCCATC TGTCTGGTCT TCTTTGTGTG CTGGGCACCC 960
TACTATGTGC TACAGCTGAC CCAGTTGTCC ATCAGCGGCC CGACCCTCAC CTTTGTCTAC 1020
TTATACAATG CGGCCATCAG CTTGGGCTAT GCCAACAGCT GCCTCAACCC CTTTGTGTAC 1080

145

ATCGTGCTCT GTGAGACGTT CCGCAAACGC TTGGTCCTGT CGGTGAAGCC TGCAGCCCAG 1140
 GGGCAGCTTC GCGCTGTCTAG CAACGCTCAG ACGGCTGACG AGGAGAGGAC AGAAAGCAAA 1200
 GGCACCTCA 1209

(193) INFORMATION FOR SEQ ID NO:192:

- 5 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 402 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant
- 10 (ii) MOLECULE TYPE: protein
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:192:
- Met Leu Cys Pro Ser Lys Thr Asp Gly Ser Gly His Ser Gly Arg Ile
 1 5 10 15
- 15 His Gln Glu Thr His Gly Glu Gly Lys Arg Asp Lys Ile Ser Asn Ser
 20 25 30
- Glu Gly Arg Glu Asn Gly Gly Arg Gly Phe Gln Met Asn Gly Gly Ser
 35 40 45
- Leu Glu Ala Glu His Ala Ser Arg Met Ser Val Leu Arg Ala Lys Pro
 50 55 60
- 20 Met Ser Asn Ser Gln Arg Leu Leu Leu Ser Pro Gly Ser Pro Pro
 65 70 75 80
- Arg Thr Gly Ser Ile Ser Tyr Ile Asn Ile Ile Met Pro Ser Val Phe
 85 90 95
- 25 Gly Thr Ile Cys Leu Leu Gly Ile Ile Gly Asn Ser Thr Val Ile Phe
 100 105 110
- Ala Val Val Lys Lys Ser Lys Leu His Trp Cys Asn Asn Val Pro Asp
 115 120 125
- Ile Phe Ile Ile Asn Leu Ser Val Val Asp Leu Leu Phe Leu Leu Gly
 130 135 140
- 30 Met Pro Phe Met Ile His Gln Leu Met Gly Asn Gly Val Trp His Phe
 145 150 155 160
- Gly Glu Thr Met Cys Thr Leu Ile Thr Ala Met Asp Ala Asn Ser Gln
 165 170 175
- 35 Phe Thr Ser Thr Tyr Ile Leu Thr Ala Met Ala Ile Asp Arg Tyr Leu
 180 185 190
- Ala Thr Val His Pro Ile Ser Ser Thr Lys Phe Arg Lys Pro Ser Val

146

	195	200	205
	Ala Thr Leu Val Ile Cys Leu Leu Trp Ala Leu Ser Phe Ile Ser Ile		
	210	215	220
5	Thr Pro Val Trp Leu Tyr Ala Arg Leu Ile Pro Phe Pro Gly Gly Ala		
	225	230	235 240
	Val Gly Cys Gly Ile Arg Leu Pro Asn Pro Asp Thr Asp Leu Tyr Trp		
		245	250 255
	Phe Thr Leu Tyr Gln Phe Phe Leu Ala Phe Ala Leu Pro Phe Val Val		
		260	265 270
10	Ile Thr Ala Ala Tyr Val Arg Ile Leu Gln Arg Met Thr Ser Ser Val		
		275	280 285
	Ala Pro Ala Ser Gln Arg Ser Ile Arg Leu Arg Thr Lys Arg Val Lys		
		290	295 300
15	Arg Thr Ala Ile Ala Ile Cys Leu Val Phe Phe Val Cys Trp Ala Pro		
		305	310 315 320
	Tyr Tyr Val Leu Gln Leu Thr Gln Leu Ser Ile Ser Arg Pro Thr Leu		
		325	330 335
	Thr Phe Val Tyr Leu Tyr Asn Ala Ala Ile Ser Leu Gly Tyr Ala Asn		
		340	345 350
20	Ser Cys Leu Asn Pro Phe Val Tyr Ile Val Leu Cys Glu Thr Phe Arg		
		355	360 365
	Lys Arg Leu Val Leu Ser Val Lys Pro Ala Ala Gln Gly Gln Leu Arg		
		370	375 380
25	Ala Val Ser Asn Ala Gln Thr Ala Asp Glu Glu Arg Thr Glu Ser Lys		
		385	390 395 400
	Gly Thr		

(194) INFORMATION FOR SEQ ID NO:193:

- 30 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 1128 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- 35 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:193:

ATGGATGTGA CTTCACAAGC CCGGGGCGTG GGCCTGGAGA TGTACCCAGG CACCGCGCAC	60
GCTGCGGCCC CCAACACCAC CTCGCCCGAG CTCAACCTGT CCCACCGCT CCTGGGCACC	120

	GCCCTGGCCA ATGGGACAGG TGAGCTCTCG GAGCACCAGC AGTACGTGAT CGGCCTGTTC	180
	CTCTCGTSCC TCTACACCAT CTTCCTCTTC CCCATCGGCT TTGTGGGCAA CATCCTGTATC	240
	CTGGTGGTGA ACATCAGCTT CCGCGAGAAG ATGACCATCC CCGACCTGTA CTTTCATCAAC	300
	CTGGCGGTGG CGGACCTCAT CCTGGTGGCC GACTCCCTCA TTGAGGTGTT CAACCTGCAC	360
5	GAGCGSTACT ACGACATCGC CGTCCTGTGC ACCTTCATGT CGCTCTTCCT GCAGGTCAAC	420
	ATGTACAGCA GCGTCTTCTT CCTACCTGG ATGAGCTTCG ACCGCTACAT CGCCCTGGCC	480
	AGGGCCATGC GCTCAGCCTT GTTCCGCACC AAGCACCACG CCCGGCTGAG CTGTGGCCTC	540
	ATCTGGATGG CATCCGTGTC AGCCACGCTG GTGCCCTTCA CCGCCGTGCA CCTGCAGCAC	600
	ACCGACGAGG CCTGCTTCTG TTTCGCGGAT GTCGCGGAGG TGCAGTGGCT CGAGGTCAAG	660
10	CTGGGCTTCA TCGTGCCCTT CGCCATCATC GGCCTGTGCT ACTCCCTCAT TGTCCGGGTG	720
	CTGGTCAGGG CGCACC GGCA CCGTGGGCTG CGGCCCCGGC GGCAGAAGGC GAAACGCATG	780
	ATCTCTCGCG TGGTGTGGT CTCTCTCGTC TGCTGGCTGC CGGAGAAGCT CTTTCATCAGC	840
	GTGCACCTCC TGCAGCGGAC GCAGCCTGGG GCCGCTCCCT GCAAGCAGTC TTTCGCGCAT	900
	GCCACCCCC TCACGGGCCA CATTGTCAAC CTCGCCGCCT TCTCCAACAG CTGCCATAAC	960
15	CCCCTCATCT ACAGCTTTCT CGGGGAGACC TTCAGGGACA AGCTGAGGCT GTACATTGAG	1020
	CAGAAAACAA ATTTGCCGGC CCTGAACCGC TTCTGTACAG CTGCCCTGAA GGCGCTCATT	1080
	CCAGACAGCA CCGAGCAGTC GGATGTGAGG TTCAGCAGTG CCGTGTGA	1128

(195) INFORMATION FOR SEQ ID NO:194:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 375 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: not relevant
- (ii) MOLECULE TYPE: protein
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:194:
- | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Asp | Val | Thr | Ser | Gln | Ala | Arg | Gly | Val | Gly | Leu | Glu | Met | Tyr | Pro |
| 1 | | | | 5 | | | | 10 | | | | | 15 | | |
| Gly | Thr | Ala | His | Ala | Ala | Ala | Pro | Asn | Thr | Thr | Ser | Pro | Glu | Leu | Asn |
| | | 20 | | | | | | 25 | | | | 30 | | | |
| Leu | Ser | His | Pro | Leu | Leu | Gly | Thr | Ala | Leu | Ala | Asn | Gly | Thr | Gly | Glu |
| | | 35 | | | | 40 | | | | | 45 | | | | |

148

Leu Ser Glu His Gln Gln Tyr Val Ile Gly Leu Phe Leu Ser Cys Leu
 50 55 60

Tyr Thr Ile Phe Leu Phe Pro Ile Gly Phe Val Gly Asn Ile Leu Ile
 65 70 75 80

5 Leu Val Val Asn Ile Ser Phe Arg Glu Lys Met Thr Ile Pro Asp Leu
 85 90 95

Tyr Phe Ile Asn Leu Ala Val Ala Asp Leu Ile Leu Val Ala Asp Ser
 100 105 110

10 Leu Ile Glu Val Phe Asn Leu His Glu Arg Tyr Tyr Asp Ile Ala Val
 115 120 125

Leu Cys Thr Phe Met Ser Leu Phe Leu Gln Val Asn Met Tyr Ser Ser
 130 135 140

Val Phe Phe Leu Thr Trp Met Ser Phe Asp Arg Tyr Ile Ala Leu Ala
 145 150 155 160

15 Arg Ala Met Arg Cys Ser Leu Phe Arg Thr Lys His His Ala Arg Leu
 165 170 175

Ser Cys Gly Leu Ile Trp Met Ala Ser Val Ser Ala Thr Leu Val Pro
 180 185 190

20 Phe Thr Ala Val His Leu Gln His Thr Asp Glu Ala Cys Phe Cys Phe
 195 200 205

Ala Asp Val Arg Glu Val Gln Trp Leu Glu Val Thr Leu Gly Phe Ile
 210 215 220

Val Pro Phe Ala Ile Ile Gly Leu Cys Tyr Ser Leu Ile Val Arg Val
 225 230 235 240

25 Leu Val Arg Ala His Arg His Arg Gly Leu Arg Pro Arg Arg Gln Lys
 245 250 255

Ala Lys Arg Met Ile Leu Ala Val Val Leu Val Phe Phe Val Cys Trp
 260 265 270

30 Leu Pro Glu Asn Val Phe Ile Ser Val His Leu Leu Gln Arg Thr Gln
 275 280 285

Pro Gly Ala Ala Pro Cys Lys Gln Ser Phe Arg His Ala His Pro Leu
 290 295 300

Thr Gly His Ile Val Asn Leu Ala Ala Phe Ser Asn Ser Cys Leu Asn
 305 310 315 320

35 Pro Leu Ile Tyr Ser Phe Leu Gly Glu Thr Phe Arg Asp Lys Leu Arg
 325 330 335

Leu Tyr Ile Glu Gln Lys Thr Asn Leu Pro Ala Leu Asn Arg Phe Cys

149

340 350

His Ala Ala Leu Lys Ala Val Ile Pro Asp Ser Thr Glu Gln Ser Asp
355 360 365

Val Arg Phe Ser Ser Ala Val
370 375

(196) INFORMATION FOR SEQ ID NO:195:

(i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 960 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:195:

ATGCCATTCC CAAACTGCTC AGCCCCCAGC ACTGTGGTGG CCACAGCTGT GGGTGTCTTG 60
CTGGGGCTGG AGTGTGGGCT GGGTCTGCTG GGCAACGCGG TGGCGCTGTG GACCTTCCTG 120
TTCGGGGTCA GGGTGTGGAA GCCGTACGCT GTCTACCTGC TCAACCTGGC CTGGGCTGAC 180
CTGCTGTGGG CTGCGTGCCCT GCCTTTCCTG GCCGCTTCT ACCTGAGCCT CCAGGCTTGG 240
CATCTGGGCG GTGTGGGCTG CTGGGCCCTG CGCTTCTCTG TGGACCTCAG CCGCAGCGTG 300
GGGATGGCCT TCCTGGCCGC CGTGGCTTTG GACCGTACC TCCGTGTGGT CCACCCCTCGG 360
CTTAAGGTCA ACCTGCTGTC TCCTCAGGCG GCCCTGGGGG TCTCGGGCCT CGTCTGGCTC 420
CTGATGGTCG CCCTCACCTG CCCGGGCTTG CTCATCTCTG AGGCCGCCCA GAACTCCACC 480
AGGTGCCACA GTTTCTACTC CAGGGCAGAC GGCTCCTTCA GCATCATCTG GCAGGAAGCA 540
CTCTCTCTGC TTCAGTTTGT CTTCCCTTTT GGCTCATCG TGTTCCTGCA TGCAGGCATC 600
ATCAGGGCTC TCCAGAAAG ACTCCGGGAG CCTGAGAAAC AGCCCAAGCT TCAGCGGGCC 660
AAGGCACTGG TCACCTTGGT GGTGGTGTCT TTTGCTCTGT GCTTTCCTGC CTGCTTCTCTG 720
GCCAGAGTCC TGATGCACAT CTTCCAGAA CTGGGGAGCT GCAGGGCCCT TTGTGCAGTG 780
GCTCATACCT CGATGTCTAC GGGCAGCCTC ACCTACCTGC ACAGTGTCTG CAACCCCGTG 840
GTATACTGCT TCTCCAGCCC CACCTTCAGG AGCTCTCTAT GGAGGGTCTT CCACACCCCTC 900
CGAGGCCAAG GGCAGGCAGC AGAGCCCCCA GATTTCAAAC CCAGAGACTC CTATTCCTGA 960

(197) INFORMATION FOR SEQ ID NO:196:

(i) SEQUENCE CHARACTERISTICS:

150

- (A) LENGTH: 319 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

5 (ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:196:

	Met	Pro	Phe	Pro	Asn	Cys	Ser	Ala	Pro	Ser	Thr	Val	Val	Ala	Thr	Ala	
	1				5					10					15		
10	Val	Gly	Val	Leu	Leu	Gly	Leu	Glu	Cys	Gly	Leu	Gly	Leu	Leu	Gly	Asn	
				20					25					30			
	Ala	Val	Ala	Leu	Trp	Thr	Phe	Leu	Phe	Arg	Val	Arg	Val	Trp	Lys	Pro	
				35					40				45				
	Tyr	Ala	Val	Tyr	Leu	Leu	Asn	Leu	Ala	Leu	Ala	Asp	Leu	Leu	Leu	Ala	
		50					55					60					
15	Ala	Cys	Leu	Pro	Phe	Leu	Ala	Ala	Phe	Tyr	Leu	Ser	Leu	Gln	Ala	Trp	
		65				70				75					80		
	His	Leu	Gly	Arg	Val	Gly	Cys	Trp	Ala	Leu	Arg	Phe	Leu	Leu	Asp	Leu	
					85					90					95		
20	Ser	Arg	Ser	Val	Gly	Met	Ala	Phe	Leu	Ala	Ala	Val	Ala	Leu	Asp	Arg	
				100					105					110			
	Tyr	Leu	Arg	Val	Val	His	Pro	Arg	Leu	Lys	Val	Asn	Leu	Leu	Ser	Pro	
		115						120					125				
	Gln	Ala	Ala	Leu	Gly	Val	Ser	Gly	Leu	Val	Trp	Leu	Leu	Met	Val	Ala	
		130					135				140						
25	Leu	Thr	Cys	Pro	Gly	Leu	Leu	Ile	Ser	Glu	Ala	Ala	Gln	Asn	Ser	Thr	
		145				150					155				160		
	Arg	Cys	His	Ser	Phe	Tyr	Ser	Arg	Ala	Asp	Gly	Ser	Phe	Ser	Ile	Ile	
				165						170					175		
30	Trp	Gln	Glu	Ala	Leu	Ser	Cys	Leu	Gln	Phe	Val	Leu	Pro	Phe	Gly	Leu	
				180					185					190			
	Ile	Val	Phe	Cys	Asn	Ala	Gly	Ile	Ile	Arg	Ala	Leu	Gln	Lys	Arg	Leu	
		195					200						205				
	Arg	Glu	Pro	Glu	Lys	Gln	Pro	Lys	Leu	Gln	Arg	Ala	Lys	Ala	Leu	Val	
		210					215					220					
35	Thr	Leu	Val	Val	Val	Leu	Phe	Ala	Leu	Cys	Phe	Leu	Pro	Cys	Phe	Leu	
		225				230					235				240		
	Ala	Arg	Val	Leu	Met	His	Ile	Phe	Gln	Asn	Leu	Gly	Ser	Cys	Arg	Ala	

151

		245		250		255	
	Leu Cys Ala Val Ala His Thr Ser Asp Val Thr Gly Ser Leu Thr Tyr						
		260		265		270	
5	Leu His Ser Val Val Asn Pro Val Val Tyr Cys Phe Ser Ser Pro Thr						
		275		280		285	
	Phe Arg Ser Ser Tyr Arg Arg Val Phe His Thr Leu Arg Gly Lys Gly						
		290		295		300	
	Gln Ala Ala Glu Pro Pro Asp Phe Asn Pro Arg Asp Ser Tyr Ser						
		305		310		315	
10	(198) INFORMATION FOR SEQ ID NO:197:						
	(i) SEQUENCE CHARACTERISTICS:						
	(A) LENGTH: 1143 base pairs						
	(B) TYPE: nucleic acid						
	(C) STRANDEDNESS: single						
15	(D) TOPOLOGY: linear						
	(ii) MOLECULE TYPE: DNA (genomic)						
	(xi) SEQUENCE DESCRIPTION: SEQ ID NO:197:						
	ATGGAGGAAG GTGTGTGATTT TGACAACTAC TATGGGGCAG ACAACCAGTC TGAGTGTGAG					60	
	TACACAGACT GGAAATCCTC GGGGGCCCTC ATCCCTGCCA TCTACATGTT GGTCTTCCTC					120	
20	CTGGGCACCA CGGGAAACGG TCTGGTGCTC TGGACCGTGT TTCGGAGCAG CCGGAGAAG					180	
	AGGCGCTCAG CTGATATCTT CATTCGTAGC CTGGCGGTGG CTGACCTGAC CTTCTGGGTG					240	
	ACGCTGCCCC TGTGGGGTAC CTACACGTAC CGGGACTATG ACTGGCCCTT TGGGACCTTC					300	
	TTCTGCAAGC TCACAGAGCTA CCTCATCTTC GTCAACATGT ACGCCAGCGT CTTTCGCCTC					360	
	ACCGGCCTCA GCTTCGACCG CTACCTGGCC ATCGTGAGGC CAGTGGCCAA TGCTCGGCTG					420	
25	AGGCTGCGGG TCAGCGGGGC CGTGCCACG GCAGTTCCTT GGTGCTGGC CGCCCTCCTG					480	
	GCCATGCCTG TCATGGTGTT ACGCACCACC GGGGACTTGG AGAACACCAC TAAGGTGCAG					540	
	TGCTACATGG ACTACTCCAT GGTGGCCACT GTGAGCTCAG AGTGGGCTG GAGGTGGGC					600	
	CTTGGGGTCT CGTCCACCAC CGTGGGCTTT GTGGTGCCCT TCACCATCAT GCTGACCTGT					660	
	TACTTCTTCA TCGCCCAAC CATCGCTGGC CACTTCCGCA AGGAACGCAT CGAGGGCCTG					720	
30	CGGAAGCGGC GCCGCTTAA GAGCATCATC GTGGTGCTGG TGGTGACCTT TGCCCTGTGC					780	
	TGGATGCCCT ACCACCTGGT GAAGACGCTG TACATGCTGG GCAGCCTGCT GCACCTGGCC					840	
	TGTGACTTTC ACCTCTTCCT CATGAACATC TTCCTTACT GCACCTGCAT CAGETACGTC					900	

152

AACAGCTGCC TCAACCCCTT CCTCTATGCC TTTTTCGACC CCGGCTTCGG CCAGGCCTGC 960
 ACCTCCATGC TCTGCTGTGG CCAGAGCAGG TCGGCAGGCA CCTCCACAG CAGCAGTGGG 1020
 GAGAAGTCAG CCAGCTACTC TTCGGGGCAC AGCCAGGGGC CCGGCCCCAA CATCGGCAAG 1080
 GGTGGAGAAC AGATGCACGA GAAATCCATC CCCTACAGCC AGGAGACCCT TGTGGTTGAC 1140
 5 TAG 1143

(199) INFORMATION FOR SEQ ID NO:198:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 380 amino acids

(B) TYPE: amino acid

(C) STRANDEDNESS:

(D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:198:

15 Met Glu Glu Gly Gly Asp Phe Asp Asn Tyr Tyr Gly Ala Asp Asn Gln
 1 5 10 15
 Ser Glu Cys Glu Tyr Thr Asp Trp Lys Ser Ser Gly Ala Leu Ile Pro
 20 25 30
 Ala Ile Tyr Met Leu Val Phe Leu Leu Gly Thr Thr Gly Asn Gly Leu
 35 40 45
 20 Val Leu Trp Thr Val Phe Arg Ser Ser Arg Glu Lys Arg Arg Ser Ala
 50 55 60
 Asp Ile Phe Ile Ala Ser Leu Ala Val Ala Asp Leu Thr Phe Val Val
 65 70 75 80
 25 Thr Leu Pro Leu Trp Ala Thr Tyr Thr Tyr Arg Asp Tyr Asp Trp Pro
 85 90 95
 Phe Gly Thr Phe Phe Cys Lys Leu Ser Ser Tyr Leu Ile Phe Val Asn
 100 105 110
 Met Tyr Ala Ser Val Phe Cys Leu Thr Gly Leu Ser Phe Asp Arg Tyr
 115 120 125
 30 Leu Ala Ile Val Arg Pro Val Ala Asn Ala Arg Leu Arg Leu Arg Val
 130 135 140
 Ser Gly Ala Val Ala Thr Ala Val Leu Trp Val Leu Ala Ala Leu Leu
 145 150 155 160
 35 Ala Met Pro Val Met Val Leu Arg Thr Thr Gly Asp Leu Glu Asn Thr
 165 170 175

153

Thr Lys Val Gln Cys Tyr Met Asp Tyr Ser Met Val Ala Thr Val Ser
 180 185 190
 Ser Glu Trp Ala Trp Glu Val Gly Leu Gly Val Ser Ser Thr Thr Val
 195 200 205
 5 Gly Phe Val Val Pro Phe Thr Ile Met Leu Thr Cys Tyr Phe Phe Ile
 210 215 220
 Ala Gln Thr Ile Ala Gly His Phe Arg Lys Glu Arg Ile Glu Gly Leu
 225 230 235 240
 10 Arg Lys Arg Arg Arg Leu Lys Ser Ile Ile Val Val Leu Val Val Thr
 245 250 255
 Phe Ala Leu Cys Trp Met Pro Tyr His Leu Val Lys Thr Leu Tyr Met
 260 265 270
 Leu Gly Ser Leu Leu His Trp Pro Cys Asp Phe Asp Leu Phe Leu Met
 275 280 285
 15 Asn Ile Phe Pro Tyr Cys Thr Cys Ile Ser Tyr Val Asn Ser Cys Leu
 290 295 300
 Asn Pro Phe Leu Tyr Ala Phe Phe Asp Pro Arg Phe Arg Gln Ala Cys
 305 310 315 320
 20 Thr Ser Met Leu Cys Cys Gly Gln Ser Arg Cys Ala Gly Thr Ser His
 325 330 335
 Ser Ser Ser Gly Glu Lys Ser Ala Ser Tyr Ser Ser Gly His Ser Gln
 340 345 350
 Gly Pro Gly Pro Asn Met Gly Lys Gly Gly Glu Gln Met His Glu Lys
 355 360 365
 25 Ser Ile Pro Tyr Ser Gln Glu Thr Leu Val Val Asp
 370 375 380

(200) INFORMATION FOR SEQ ID NO:199:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 1119 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
 (ii) MOLECULE TYPE: DNA (genomic)
 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:199:
 35 ATGAAC TACC CGCTAACGCT GGAAATGGAC CTCGAGAACC TGGAGGACCT GTTCTGGGAA 60
 CTGGACAGAT TGGACAAC TAACGACACC TCCCTGGTGG AAAATCATCT CTGCCCTGCC 120

154

ACAGAGGGTC CCCTCATGGC CTCCTTCAAG GCCGTGTTGG TGCCCGTGGC CTACAGCCTC 180
 ATCTTCCTCC TGGGCGTGAT CGGCAACGTC CTGGTGTCTGG TGATCTTGGA GCGGCACCGG 240
 CAGACACGCA GTTCCACGGA GACCTTCCTG TTCCACCTGG CCGTGGCCGA CCTCTGCTG 300
 GTCTTCATCT TGCCCTTTGC CGTGGCCGAG GGCTCTGTGG GCTGGGTCTT GGGGACCTTC 360
 5 CTCTGCAAAA CTGTGATTGC CCTGCACAAA GTCAACTTCT ACTGCAGCAG CTTGTCTCTG 420
 GCCTGCATCG CCGTGGACCG CTACCTGGCC ATTGTCCACG CCGTCCATGC CTACCGCCAC 480
 CGCCGCTCC TCTCCATCCA CATCACTGT GGGACCATCT GGCTGGTGGG CTTCTCTCTT 540
 GCCTTGCCAG AGATTCTCTT CGCCAAAGTC AGCCAAGGCC ATCACAACAA CTCCTGCCA 600
 CGTTGCACCT TCTCCCAAGA GAACCAAGCA GAAACGCATG CCTGGTTCAC CTCCTGATTC 660
 10 CTCTACCATG TGGCGGGATT CCTGCTGCCC ATGCTGGTGA TGGGCTGGTG CTACGTGGGG 720
 GTAGTGACACA GGTTCGCGCA GGGCCAGCGG CGCCCTCAGC GGCAGAAGGC AAAAAGGGTG 780
 GCCATCTGG TGACAAGCAT CTTCTTCCTC TGCTGGTCAC CCTACCACAT CGTCATCTTC 840
 CTGGACACCC TGGCGAGGCT GAAGGCCGTG GACAAATACCT GCAAGCTGAA TGGCTCTCTC 900
 CCGTGCGCA TCACCATGTG TGAGTTCCTG GGCCTGGCCC ACTGCTGCCT CAACCCCATG 960
 15 CTCTACACTT TCGCCGGCGT GAAGTTCGCG AGTGACCTGT CGCGGCTCCT GACCAAGCTG 1020
 GGCTGTACCG GCCCTGCCTC CCTGTGCCAG CTCTTCCTTA GCTGGCGCAG GAGCAGTCTC 1080
 TCTGAGTCAG AGAATGCCAC CTCTCTCACC ACGTTCTAG 1119

(201) INFORMATION FOR SEQ ID NO:200:

- (i) SEQUENCE CHARACTERISTICS:
 20 (A) LENGTH: 372 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant
 (ii) MOLECULE TYPE: protein

- 25 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:200:

Met Asn Tyr Pro Leu Thr Leu Glu Met Asp Leu Glu Asn Leu Glu Asp
 1 5 10 15
 Leu Phe Trp Glu Leu Asp Arg Leu Asp Asn Tyr Asn Asp Thr Ser Leu
 20 25 30
 30 Val Glu Asn His Leu Cys Pro Ala Thr Glu Gly Pro Leu Met Ala Ser
 35 40 45
 Phe Lys Ala Val Phe Val Pro Val Ala Tyr Ser Leu Ile Phe Leu Leu

155

	50		55		60	
	Gly Val Ile Gly Asn Val Leu Val Leu Val Ile Leu Glu Arg His Arg					
	65		70		75	80
5	Gln Thr Arg Ser Ser Thr Glu Thr Phe Leu Phe His Leu Ala Val Ala					
		85		90		95
	Asp Leu Leu Leu Val Phe Ile Leu Pro Phe Ala Val Ala Glu Gly Ser					
		100		105		110
	Val Gly Trp Val Leu Gly Thr Phe Leu Cys Lys Thr Val Ile Ala Leu					
		115		120		125
10	His Lys Val Asn Phe Tyr Cys Ser Ser Leu Leu Leu Ala Cys Ile Ala					
		130		135		140
	Val Asp Arg Tyr Leu Ala Ile Val His Ala Val His Ala Tyr Arg His					
		145		150		155
15	Arg Arg Leu Leu Ser Ile His Ile Thr Cys Gly Thr Ile Trp Leu Val					
		165		170		175
	Gly Phe Leu Leu Ala Leu Pro Glu Ile Leu Phe Ala Lys Val Ser Gln					
		180		185		190
	Gly His His Asn Asn Ser Leu Pro Arg Cys Thr Phe Ser Gln Glu Asn					
		195		200		205
20	Gln Ala Glu Thr His Ala Trp Phe Thr Ser Arg Phe Leu Tyr His Val					
		210		215		220
	Ala Gly Phe Leu Leu Pro Met Leu Val Met Gly Trp Cys Tyr Val Gly					
		225		230		235
25	Val Val His Arg Leu Arg Gln Ala Gln Arg Arg Pro Gln Arg Gln Lys					
		245		250		255
	Ala Lys Arg Val Ala Ile Leu Val Thr Ser Ile Phe Phe Leu Cys Trp					
		260		265		270
	Ser Pro Tyr His Ile Val Ile Phe Leu Asp Thr Leu Ala Arg Leu Lys					
		275		280		285
30	Ala Val Asp Asn Thr Cys Lys Leu Asn Gly Ser Leu Pro Val Ala Ile					
		290		295		300
	Thr Met Cys Glu Phe Leu Gly Leu Ala His Cys Cys Leu Asn Pro Met					
		305		310		315
35	Leu Tyr Thr Phe Ala Gly Val Lys Phe Arg Ser Asp Leu Ser Arg Leu					
		325		330		335
	Leu Thr Lys Leu Gly Cys Thr Gly Pro Ala Ser Leu Cys Gln Leu Phe					
		340		345		350

156

Pro Ser Trp Arg Arg Ser Ser Leu Ser Glu Ser Glu Asn Ala Thr Ser
 355 360 365

Leu Thr Thr Phe
 370

5 (202) INFORMATION FOR SEQ ID NO:201:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 1128 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 10 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:201:

ATGGATGTGA CTTCCCAAGC CCGGGGCGTG GGCCTGGAGA TGTACCCAGG CACCGCGCAG 60
 CCTGCGGCCC CCAACACCAC CTCCTCCGAG CTCACCTGT CCCACCCGCT CCTGGGCACC 120
 15 GCGCTGGCCA ATGGGACAGG TGAGCTCTCG GAGCACCAGC AGTACGTGAT CGGCTGTTC 180
 CTCTCGTGCC TCTACACCAT CTTCCTCTTC CCCATCGGCT TTGTGGGCAA CATCCTGATC 240
 CTGGTGGTGA ACATCAGCTT CCGCGAGAAG ATGACCATCC CCGACCTGTA CTTTCATCAAC 300
 CTGGCGGTGG CGGACCTCAT CCTGGTGCC GACTCCCTCA TTGAGGTGTT CAACCTGCAC 360
 GAGCGGTACT ACGACATCGC CGTCCTGTGC ACCTTCATGT CGCTCTTCTT GCAGSTCAAC 420
 20 ATGTACAGCA GCGTCTTCTT CCTCACCTGG ATGAGCTTCG ACCGCTACAT CGCCCTGGCC 480
 AGGGCCATGC GCTGCAGCCT GTTCCGCACC AAGCACACAG CCCGGCTGAG CTGTGGCCTC 540
 ATCTGGATGG CATCCGTGTC AGCCACGCTG GTGCCCTTCA CCGCCGTGCA CCGCAGCAGC 600
 ACCGACGAGG CCTGCTTCTG TTTCCGCGAT GTCCGGGAGG TGCAGTGGCT CGAGGTACAG 660
 CTGGGCTTCA TCGTGCCCTT CGCCATCATC GGCCTGTGCT ACTCCCTCAT TGTCCGGGTG 720
 25 CTGGTCAGGG CGCACCGGCA CCGTGGGCTG CGGCCCCGGC GGAGAAGGC GAAGCGCATG 780
 ATCCTCGCGG TGGTGTGGT CTTCTTCGTC TGCTGGCTGC CGGAGAAGCT CTTTCATCAGC 840
 GTGCACCTCC TGCAGCGGAC GCAGCCTGGG GCGCTCCCT GCAAGCAGTC TTTCCGCCAT 900
 GCCCACCCCC TCACGGGCCA CATTGTCAAC CTCACCGCCT TCTCCAACAG CTGCCTAAAC 960
 CCCCTCATCT ACAGCTTTCT CGGGGAGACC TTCAGGGACA AGCTGAGGCT GTACATTGAG 1020
 30 CAGAAAACAA ATTTGCGCGC CCTGAACCGC TTCTGTCAAG CTGCCTGAA GGCCGTCATT 1080
 CCAGACAGCA CCGAGCAGTC GGATGTGAGG TTCAGCAGTG CCGTGTA 1128

157

(203) INFORMATION FOR SEQ ID NO:202:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 375 amino acids

(B) TYPE: amino acid

(C) STRANDEDNESS:

(D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:202:

10 Met Asp Val Thr Ser Gln Ala Arg Gly Val Gly Leu Glu Met Tyr Pro
 1 5 10 15
 Gly Thr Ala Gln Pro Ala Ala Pro Asn Thr Thr Ser Pro Glu Leu Asn
 20 25 30
 Leu Ser His Pro Leu Leu Gly Thr Ala Leu Ala Asn Gly Thr Gly Glu
 35 40 45
 15 Leu Ser Glu His Gln Gln Tyr Val Ile Gly Leu Phe Leu Ser Cys Leu
 50 55 60
 Tyr Thr Ile Phe Leu Phe Pro Ile Gly Phe Val Gly Asn Ile Leu Ile
 65 70 75 80
 20 Leu Val Val Asn Ile Ser Phe Arg Glu Lys Met Thr Ile Pro Asp Leu
 85 90 95
 Tyr Phe Ile Asn Leu Ala Val Ala Asp Leu Ile Leu Val Ala Asp Ser
 100 105 110
 Leu Ile Glu Val Phe Asn Leu His Glu Arg Tyr Tyr Asp Ile Ala Val
 115 120 125
 25 Leu Cys Thr Phe Met Ser Leu Phe Leu Gln Val Asn Met Tyr Ser Ser
 130 135 140
 Val Phe Phe Leu Thr Trp Met Ser Phe Asp Arg Tyr Ile Ala Leu Ala
 145 150 155 160
 30 Arg Ala Met Arg Cys Ser Leu Phe Arg Thr Lys His His Ala Arg Leu
 165 170 175
 Ser Cys Gly Leu Ile Trp Met Ala Ser Val Ser Ala Thr Leu Val Pro
 180 185 190
 Phe Thr Ala Val His Leu Gln His Thr Asp Glu Ala Cys Phe Cys Phe
 195 200 205
 35 Ala Asp Val Arg Glu Val Gln Trp Leu Glu Val Thr Leu Gly Phe Ile
 210 215 220
 Val Pro Phe Ala Ile Ile Gly Leu Cys Tyr Ser Leu Ile Val Arg Val

158

	225		230		235		240
	Leu Val Arg Ala His Arg His Arg Gly Leu Arg Pro Arg Arg Gln Lys						
		245			250		255
5	Ala Lys Arg Met Ile Leu Ala Val Val Leu Val Phe Phe Val Cys Trp						
		260			265		270
	Leu Pro Glu Asn Val Phe Ile Ser Val His Leu Leu Gln Arg Thr Gln						
		275			280		285
	Pro Gly Ala Ala Pro Cys Lys Gln Ser Phe Arg His Ala His Pro Leu						
		290			295		300
10	Thr Gly His Ile Val Asn Leu Thr Ala Phe Ser Asn Ser Cys Leu Asn						
		305			310		315
	Pro Leu Ile Tyr Ser Phe Leu Gly Glu Thr Phe Arg Asp Lys Leu Arg						
		325			330		335
15	Leu Tyr Ile Glu Gln Lys Thr Asn Leu Pro Ala Leu Asn Arg Phe Cys						
		340			345		350
	His Ala Ala Leu Lys Ala Val Ile Pro Asp Ser Thr Glu Gln Ser Asp						
		355			360		365
	Val Arg Phe Ser Ser Ala Val						
		370			375		
20	(204) INFORMATION FOR SEQ ID NO:203:						
	(i) SEQUENCE CHARACTERISTICS:						
	(A) LENGTH: 1137 base pairs						
	(B) TYPE: nucleic acid						
25	(C) STRANDEDNESS: single						
	(D) TOPOLOGY: linear						
	(ii) MOLECULE TYPE: DNA (genomic)						
	(xi) SEQUENCE DESCRIPTION: SEQ ID NO:203:						
	ATGGACCTGG GGAACCAAT GAAAAGCGTG CTGGTGGTGG CTCCTCTGT CATTTTCCAG						60
	GTATGCCTGT GTCAAGATGA GGTACGCGAC GATTACATCG GAGACAACAC CACAGTGGAC						120
30	TACACTTTGT TCGAGTCTTT GTGCTCCAAG AAGGACGTGC GGAACTTTAA AGCCTGGTTC						180
	CTCCCTATCA TGTACTCCAT CATTTGTTTC GTGGGCCTAC TGGGCAATGG GCTGGTCGTG						240
	TTGACCTATA TCTATTTCAA GAGGCTCAAG ACCATGACCG ATACCTACCT GCTCAACCTG						300
	GCGGTGGCAG ACATCCTCTT CTTCTGACC CTTCCCTTCT GGGCCTACAG CGGCGCCAAG						360
	TCCTGGGTCT TCGGTGTCCA CTTTGTCAAG CTCATCTTTG CCATCTACAA GATGAGCTTC						420

TTCAGTGGCA TGCTCCTACT TCTTTGCATC AGCATTGACC GCTACGTGGC CATCGTCCAG 480
 GCTGTCTCAG CTCACCGCCA CGGTGCCCGC GTCCCTTCTCA TCAGCAAGCT GTCCGTGTGTG 540
 GGCATCTGGA TACTAGCCAC AGTGCTCTCC ATCCCAGAGC TCCTGTACAG TGACCTCCAG 600
 AGGAGCAGCA GTGAGCAAGC GATGCGATGC TCTCTCATCA CAGAGCATGT GGAGGCCTTT 660
 5 ATCACCATTCC AGGTGGCCCA GATGGTGATC GGCTTTCTGG TCCCCCTGCT GGCCATGAGC 720
 TTCTGTIACC TTGTATCATC CCGCACCTTG CTCCAGGCAC GCAACTTTGA GCGCAACAAG 780
 GCCAAAAGG TGATCATCGC TGTGGTCGTG GTCTTCATAG TCTTCCAGCT GCCTTACAAT 840
 GGGGTGTGCC TGGCCAGAC GGTGGCCAAC TTCAACATCA CCAGTAGCAC CTGTGAGCTC 900
 AGTAAGCAAC TCAACATCGC CTACGACGTC ACCTACAGCC TGGCCTGCGT CCGTGCTGTC 960
 10 GTCAACCTTT TCTGTACGC CTTCATCGGC GTCAAGTCC GCAACGATCT CTTCAAGCTC 1020
 TTCAAGGACC TGGGCTGCCT CAGCCAGGAG CAGCTCCGGC AGTGGTCTTC CTGTGCGCAC 1080
 ATCGGCGCT CCTCCATGAG TGTGGAGGCC GAGACCACCA CCACCTTCTC CCCATAG 1137

(205) INFORMATION FOR SEQ ID NO:204:

- 15 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 378 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

- 20 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:204:

Met Asp Leu Gly Lys Pro Met Lys Ser Val Leu Val Val Ala Leu Leu
 1 5 10 15
 Val Ile Phe Gln Val Cys Leu Cys Gln Asp Glu Val Thr Asp Asp Tyr
 20 25 30
 25 Ile Gly Asp Asn Thr Thr Val Asp Tyr Thr Leu Phe Glu Ser Leu Cys
 35 40 45
 Ser Lys Lys Asp Val Arg Asn Phe Lys Ala Trp Phe Leu Pro Ile Met
 50 55 60
 30 Tyr Ser Ile Ile Cys Phe Val Gly Leu Leu Gly Asn Gly Leu Val Val
 65 70 75 80
 Leu Thr Tyr Ile Tyr Phe Lys Arg Leu Lys Thr Met Thr Asp Thr Tyr
 85 90 95
 Leu Leu Asn Leu Ala Val Ala Asp Ile Leu Phe Leu Leu Thr Leu Pro

160

	100	105	110
	Phe Trp Ala Tyr Ser Ala Ala Lys Ser Trp Val Phe Gly Val His Phe 115 120 125		
5	Cys Lys Leu Ile Phe Ala Ile Tyr Lys Met Ser Phe Phe Ser Gly Met 130 135 140		
	Leu Leu Leu Leu Cys Ile Ser Ile Asp Arg Tyr Val Ala Ile Val Gln 145 150 155 160		
	Ala Val Ser Ala His Arg His Arg Ala Arg Val Leu Leu Ile Ser Lys 165 170 175		
10	Leu Ser Cys Val Gly Ile Trp Ile Leu Ala Thr Val Leu Ser Ile Pro 180 185 190		
	Glu Leu Leu Tyr Ser Asp Leu Gln Arg Ser Ser Ser Glu Gln Ala Met 195 200 205		
15	Arg Cys Ser Leu Ile Thr Glu His Val Glu Ala Phe Ile Thr Ile Gln 210 215 220		
	Val Ala Gln Met Val Ile Gly Phe Leu Val Pro Leu Leu Ala Met Ser 225 230 235 240		
	Phe Cys Tyr Leu Val Ile Ile Arg Thr Leu Leu Gln Ala Arg Asn Phe 245 250 255		
20	Glu Arg Asn Lys Ala Lys Lys Val Ile Ile Ala Val Val Val Val Phe 260 265 270		
	Ile Val Phe Gln Leu Pro Tyr Asn Gly Val Val Leu Ala Gln Thr Val 275 280 285		
25	Ala Asn Phe Asn Ile Thr Ser Ser Thr Cys Glu Leu Ser Lys Gln Leu 290 295 300		
	Asn Ile Ala Tyr Asp Val Thr Tyr Ser Leu Ala Cys Val Arg Cys Cys 305 310 315 320		
	Val Asn Pro Phe Leu Tyr Ala Phe Ile Gly Val Lys Phe Arg Asn Asp 325 330 335		
30	Leu Phe Lys Leu Phe Lys Asp Leu Gly Cys Leu Ser Gln Glu Gln Leu 340 345 350		
	Arg Gln Trp Ser Ser Cys Arg His Ile Arg Arg Ser Ser Met Ser Val 355 360 365		
35	Glu Ala Glu Thr Thr Thr Thr Phe Ser Pro 370 375		

(206) INFORMATION FOR SEQ ID NO:205:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 1086 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:205:

ATGGATATAC AAATGGCAAA CAATTTTACT CCGCCCTCTG CAATCCTCA GGGAAATGAC 60
 TGTGACCTCT ATGCACATCA CAGCACGGCC AGGATAGTAA TGCCTCTGCA TTACAGCCTC 120
 10 GTCTTCATCA TTGGGCTCGT GGGAAACTTA CTAGCCTTGG TCGTCATTGT TCAAAACAGG 180
 AAAAAAATCA ACTCTACCAC CCTCTATTCA ACAAAATTGG TGATTTCTGA TATACTTTTT 240
 ACCACGGCTT TGCCTACACG AATAGCCTAC TATGCAATGG GCTTTGACTG GAGAATCGGA 300
 GATGCCTTGT GTAGGATAAC TGCCTAGTAG TTTTACATCA ACACATATGC AGGTGTGAAC 360
 TTTTAGACCT GCCTGAGTAT TGACCGCTTC ATTGCTGTGG TGCACCCCTCT ACGCTACAAC 420
 15 AAGATAAAAA GGATTGAACA TGCAAAAGGC GTGTGCATAT TTGTCTGGAT TCTAGTATTT 480
 GCTCAGACAC TCCCACTCCT CATCAACCCT ATGTCAAAGC AGGAGGCTGA AAGGATTACA 540
 TGCATGGAGT ATCCAAACTT TGAAGAAACT AAATCTCTTC CCTGGATTCT GCTTGGGGCA 600
 TGTTCATAG GATATGTACT TCCACTTATA ATCATTCTCA TCTGCTATTG TCAGATCTGC 660
 TGCAAACTCT TCAGAACTGC CAAACAAAC CCACTCACTG AGAAATCTGG TGTAAACAAA 720
 20 AAGGCTAAAA ACACAATTAT TCTTATTATT GTTGTGTTTG TTCTCTGTTT CACACCTTAC 780
 CATGTTGCAA TTATTCAACA TATGATTAAAG AAGCTTCGTT TCTCTAAATT CCTGGAATGT 840
 AGCCAAAGAC ATTCGTTCCA GATTCTCTG CACTTTACAG TATGCCTGAT GAATTTCAAT 900
 TGCTGCATGG ACCCTTTTAT CTACTTCTTT GCATGTAAG GGTATAAGAG AAAGGTTATG 960
 AGGATGCTGA AACGGCAAGT CAGTGTATCG ATTTCTAGTG CTGTGAAGTC AGCCCTGAA 1020
 25 GAAATTCAC GTGAAATGAC AGAAACGCAG ATGATGATAC ATTCCAAGTC TTCAAATGGA 1080
 AAGTGA 1086

(207) INFORMATION FOR SEQ ID NO:206:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 361 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

162

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:206:

	Met	Asp	Ile	Gln	Met	Ala	Asn	Asn	Phe	Thr	Pro	Pro	Ser	Ala	Thr	Pro	
	1				5					10					15		
5	Gln	Gly	Asn	Asp	Cys	Asp	Leu	Tyr	Ala	His	His	Ser	Thr	Ala	Arg	Ile	
				20					25					30			
	Val	Met	Pro	Leu	His	Tyr	Ser	Leu	Val	Phe	Ile	Ile	Gly	Leu	Val	Gly	
				35				40					45				
10	Asn	Leu	Leu	Ala	Leu	Val	Val	Ile	Val	Gln	Asn	Arg	Lys	Lys	Ile	Asn	
				50			55					60					
	Ser	Thr	Thr	Leu	Tyr	Ser	Thr	Asn	Leu	Val	Ile	Ser	Asp	Ile	Leu	Phe	
	65					70					75				80		
	Thr	Thr	Ala	Leu	Pro	Thr	Arg	Ile	Ala	Tyr	Tyr	Ala	Met	Gly	Phe	Asp	
					85					90				95			
15	Trp	Arg	Ile	Gly	Asp	Ala	Leu	Cys	Arg	Ile	Thr	Ala	Leu	Val	Phe	Tyr	
				100					105					110			
	Ile	Asn	Thr	Tyr	Ala	Gly	Val	Asn	Phe	Met	Thr	Cys	Leu	Ser	Ile	Asp	
				115				120					125				
20	Arg	Phe	Ile	Ala	Val	Val	His	Pro	Leu	Arg	Tyr	Asn	Lys	Ile	Lys	Arg	
		130					135					140					
	Ile	Glu	His	Ala	Lys	Gly	Val	Cys	Ile	Phe	Val	Trp	Ile	Leu	Val	Phe	
	145					150					155				160		
	Ala	Gln	Thr	Leu	Pro	Leu	Leu	Ile	Asn	Pro	Met	Ser	Lys	Gln	Glu	Ala	
				165					170					175			
25	Glu	Arg	Ile	Thr	Cys	Met	Glu	Tyr	Pro	Asn	Phe	Glu	Glu	Thr	Lys	Ser	
				180					185					190			
	Leu	Pro	Trp	Ile	Leu	Leu	Gly	Ala	Cys	Phe	Ile	Gly	Tyr	Val	Leu	Pro	
			195				200						205				
30	Leu	Ile	Ile	Ile	Leu	Ile	Cys	Tyr	Ser	Gln	Ile	Cys	Cys	Lys	Leu	Phe	
		210					215					220					
	Arg	Thr	Ala	Lys	Gln	Asn	Pro	Leu	Thr	Glu	Lys	Ser	Gly	Val	Asn	Lys	
	225					230					235				240		
	Lys	Ala	Lys	Asn	Thr	Ile	Ile	Leu	Ile	Ile	Val	Val	Phe	Val	Leu	Cys	
				245					250					255			
35	Phe	Thr	Pro	Tyr	His	Val	Ala	Ile	Ile	Gln	His	Met	Ile	Lys	Lys	Leu	
				260				265						270			

163

Arg Phe Ser Asn Phe Leu Glu Cys Ser Gln Arg His Ser Phe Gln Ile
 275 280 285
 Ser Leu His Phe Thr Val Cys Leu Met Asn Phe Asn Cys Cys Met Asp
 290 295 300
 5 Pro Phe Ile Tyr Phe Phe Ala Cys Lys Gly Tyr Lys Arg Lys Val Met
 305 310 315 320
 Arg Met Leu Lys Arg Gln Val Ser Val Ser Ile Ser Ser Ala Val Lys
 325 330 335
 10 Ser Ala Pro Glu Glu Asn Ser Arg Glu Met Thr Glu Thr Gln Met Met
 340 345 350
 Ile His Ser Lys Ser Ser Asn Gly Lys
 355 360

(208) INFORMATION FOR SEQ ID NO:207:

- 15 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 1446 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
 (ii) MOLECULE TYPE: DNA (genomic)

- 20 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:207:

ATGCGGTGGC TGTGGCCCCC GGCTGTCTCT CTTGCTGTGA TTTGGCTGT GGGGCTAAGC 60
 AGGGTCTCTG GGGGTGCCCC CCTGCACCTG GGCAGGCACA GAGCCGAGAC CCAGGAGCAG 120
 CAGAGCCGAT CCAAGAGGGG CACCGAGGAT GAGGAGGCCA AGGGCGTGCA GCAGTATGTG 180
 CCTGAGGAGT GGGCGGAGTA CCCCCGCCCC ATTCAACCCTG CTGGCTTGCA GCCAACCAAG 240
 25 CCCTTGSTGG CCACCAGCCC TAACCCGAC AAGGATGGGG GCACCCAGAG CAGTGGGCAG 300
 GAATCTAGGG GCAATCTGAC AGGGGCACCA GGGCAGAGGC TACAGATCCA GAACCCCTGT 360
 TATCCGGTGA CCGAGAGCTC CTACAGTGCC TATGCCATCA TGCTTCTGGC GCTGGTGGTG 420
 TTTGCGSTGG GCATGTGGG CAACCTGTCT GTCATGTGCA TCGTGTGGCA CAGCTACTAC 480
 CTGAAGAGCG CCTGGAACCT CATCCTTGCC AGCCTGGCCC TCTGGGATT TCTGGTCTCT 540
 30 TTTTCTGCCC TCCTATATGT CATCTCAAC GAGATCACCA AGCAGAGGCT ACTGGGTGAC 600
 GTTCTTGTC GTGCCGTGCC CTTATGGAG GTCTCCTCTC TGGGAGTCAC GACTTTTCAGC 660
 CTCGTGTCCT TGGGCATTGA CCGCTTCCAC GTGGCCACCA GCACCTTGCC CAAGGTGAGG 720
 CCCATCGAGC GGTGCCAATC CATCCTGGCC AAGTTGGCTG TCATCTGGGT GGGCTCCATG 780

164

ACGCTGGCTG TGCCGTGAGCT CCTGCTGTGG CAGCTGGCAC AGGAGCCTGC CCCACCATG 840
 GGCACCTCGG ACTCATGCAT CATGAAACCC TCAGCCAGCC TGCCCGAGTC CCTGTATTCA 900
 CTGGTGATGA CCTACCAGAA CGCCCGCATG TGGTGGTACT TTGGTGCTA CTTCTGCCTG 960
 CCCATCCTCT TCACAGTCAC CTGCCAGCTG GTGACATGGC GGGTGCGAGG CCCTCCAGGG 1020
 5 AGGAAGTCAG AGTGCAGGGC CAGCAAGCAC GAGCAGTGTG AGAGCCAGCT CAAGAGCACC 1080
 GTGGTGGGCC TGACCGTGGT CTACGCCTTC TGCACCTCC CAGAGAACGT CTGCAACATC 1140
 GTGTGGCCT ACCTCTCCAC CGAGCTGACC CGCCAGACCC TGGACCTCCT GGGCCTCATC 1200
 AACCAGTTCT CCACCTTCTT CAAGGGCGCC ATCACCCAG TGCTGCTCCT TTGCATCTGC 1260
 AGGCCGCTGG GCCAGGCCTT CCTGGACTGC TGCTGCTGCT GCTGCTGTGA GGAGTGCGGC 1320
 10 GGGGCTTCGG AGGCCTCTGC TGCCAATGGG TCGGACAACA AGCTCAAGAC CGAGGTGTCC 1380
 TCTTCCATCT ACTTCCACAA GCCCAGGGAG TCACCCCCAC TCCTGCCCTT GGGCACACCT 1440
 TGCTGA 1446

(209) INFORMATION FOR SEQ ID NO:208:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 481 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:208:

Met Arg Trp Leu Trp Pro Leu Ala Val Ser Leu Ala Val Ile Leu Ala
 1 5 10 15
 Val Gly Leu Ser Arg Val Ser Gly Gly Ala Pro Leu His Leu Gly Arg
 20 25 30
 25 His Arg Ala Glu Thr Gln Glu Gln Gln Ser Arg Ser Lys Arg Gly Thr
 35 40 45
 Glu Asp Glu Glu Ala Lys Gly Val Gln Gln Tyr Val Pro Glu Glu Trp
 50 55 60
 30 Ala Glu Tyr Pro Arg Pro Ile His Pro Ala Gly Leu Gln Pro Thr Lys
 65 70 75 80
 Pro Leu Val Ala Thr Ser Pro Asn Pro Asp Lys Asp Gly Gly Thr Pro
 85 90 95
 Asp Ser Gly Gln Glu Leu Arg Gly Asn Leu Thr Gly Ala Pro Gly Gln

165

	100	105	110
	Arg Leu Gln Ile Gln Asn Pro Leu Tyr Pro Val Thr Glu Ser Ser Tyr 115	120	125
5	Ser Ala Tyr Ala Ile Met Leu Leu Ala Leu Val Val Phe Ala Val Gly 130	135	140
	Ile Val Gly Asn Leu Ser Val Met Cys Ile Val Trp His Ser Tyr Tyr 145	150	155
	Leu Lys Ser Ala Trp Asn Ser Ile Leu Ala Ser Leu Ala Leu Trp Asp 165	170	175
10	Phe Leu Val Leu Phe Phe Cys Leu Pro Ile Val Ile Phe Asn Glu Ile 180	185	190
	Thr Lys Gln Arg Leu Leu Gly Asp Val Ser Cys Arg Ala Val Pro Phe 195	200	205
15	Met Glu Val Ser Ser Leu Gly Val Thr Thr Phe Ser Leu Cys Ala Leu 210	215	220
	Gly Ile Asp Arg Phe His Val Ala Thr Ser Thr Leu Pro Lys Val Arg 225	230	235
	Pro Ile Glu Arg Cys Gln Ser Ile Leu Ala Lys Leu Ala Val Ile Trp 245	250	255
20	Val Gly Ser Met Thr Leu Ala Val Pro Glu Leu Leu Leu Trp Gln Leu 260	265	270
	Ala Gln Glu Pro Ala Pro Thr Met Gly Thr Leu Asp Ser Cys Ile Met 275	280	285
25	Lys Pro Ser Ala Ser Leu Pro Glu Ser Leu Tyr Ser Leu Val Met Thr 290	295	300
	Tyr Gln Asn Ala Arg Met Trp Trp Tyr Phe Gly Cys Tyr Phe Cys Leu 305	310	315
	Pro Ile Leu Phe Thr Val Thr Cys Gln Leu Val Thr Trp Arg Val Arg 325	330	335
30	Gly Pro Pro Gly Arg Lys Ser Glu Cys Arg Ala Ser Lys His Glu Gln 340	345	350
	Cys Glu Ser Gln Leu Lys Ser Thr Val Val Gly Leu Thr Val Val Tyr 355	360	365
35	Ala Phe Cys Thr Leu Pro Glu Asn Val Cys Asn Ile Val Val Ala Tyr 370	375	380
	Leu Ser Thr Glu Leu Thr Arg Gln Thr Leu Asp Leu Leu Gly Leu Ile 385	390	395
			400

166

Asn Gln Phe Ser Thr Phe Phe Lys Gly Ala Ile Thr Pro Val Leu Leu
 405 410 415
 Leu Cys Ile Cys Arg Pro Leu Gly Gln Ala Phe Leu Asp Cys Cys Cys
 420 425 430
 5 Cys Cys Cys Cys Glu Glu Cys Gly Gly Ala Ser Glu Ala Ser Ala Ala
 435 440 445
 Asn Gly Ser Asp Asn Lys Leu Lys Thr Glu Val Ser Ser Ser Ile Tyr
 450 455 460
 10 Phe His Lys Pro Arg Glu Ser Pro Pro Leu Leu Pro Leu Gly Thr Pro
 465 470 475 480
 Cys

(210) INFORMATION FOR SEQ ID NO:209:

- (i) SEQUENCE CHARACTERISTICS:
 15 (A) LENGTH: 1101 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
 (ii) MOLECULE TYPE: DNA (genomic)

- 20 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:209:

ATGTGGAACG CGACGCCAG CGAAGAGCCG GGGTTCAACC TCACACTGGC CGACCTGGAC 60
 TGGGATGCTT CCCCCGCAA CGACTCGCTG GCGACGAGC TGCTGCAGCT CTTCCCCGCG 120
 CCGTGCTGG CGGGCGTCAC AGCCACCTGC GTGGCACTCT TCGTGGTGGG TATCGCTGGC 180
 AACTGCTCA CCATGCTGGT GGTGTGCGCG TTCCGCGAGC TGCGCACCAC CACCAACCTC 240
 25 TACCTGTCCA GCATGGCCTT CTCGATCTG CTCATCTTCC TCTGCATGCC CCTGGACCTC 300
 GTTCGCCTCT GGCAGTACCG GGCCTGGAAC TTGCGCGACC TCCTCTGCAA ACTCTTCCAA 360
 TTCGTCACTG AGAGCTGCAC CTACGCCACG GTGCTACCA TCACAGCGCT GAGCGTCGAG 420
 CGCTACTTGC CCATCTGCTT CCCACTCCGG GCCAAGGTGG TGGTCACCAA GGGGCGGGTG 480
 AAGTGGTCA TCCTCGTCAT CTGGGCGGTG GCCTTCTGCA GCGCGGGGCC CATCTCTGTG 540
 30 CTAGTCGGGG TGGAGCAGCA GAACGGCACC GACCCTTGGG ACACCAACGA GTGCGCCCCC 600
 ACCGAGTTTG CGGTGCGCTC TGGACTGCTC ACGGTCATGG TGTGGGTGTG CAGCATCTTC 660
 TTCTTCTTTC CTGTCTTCTG TCTCAGGTC CTCTACAGTC TCATCGCGAG GAAGCTGTGG 720
 CGGAGGAGGC GCGGCGATGC TGTCTGGGTG GCCTCGCTCA GGGACCAGAA CCACAAGCAA 780

167

ACCAAGAAAA TGCTGGCTGT AGTGGTGTIT GCCTTCATCC TCTGCTGGCT CCCCTTCCAC 840
 GTAGGGCGAT ATTTATTTTC CAAATCCTTT GAGCCTGGCT CCTTGGAGAT TGCTCAGATC 900
 AGCCAGTACT GCAACCTCGT GTCCTTTGTC CTCTTCTACC TCACTGCTGC CATCAACCCC 960
 ATTCTGTACA ACATCATGTC CAAGAAGTAC CGGGTGGCAG TGTTCACTACT TCTGGGATTC 1020
 5 GAACCTTCTT CCCAGAGAAA GCTCTCCACT CTGAAAGATG AAGTTCTCG GGCCTGGACA 1080
 GAATCTAGTA TTAATACATG A 1101

(211) INFORMATION FOR SEQ ID NO:210:

(i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 366 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant
 10
 (ii) MOLECULE TYPE: protein
 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:210:
 15 Met Trp Asn Ala Thr Pro Ser Glu Glu Pro Gly Phe Asn Leu Thr Leu
 1 5 10 15
 Ala Asp Leu Asp Trp Asp Ala Ser Pro Gly Asn Asp Ser Leu Gly Asp
 20 20 25 30
 Glu Leu Leu Gln Leu Phe Pro Ala Pro Leu Leu Ala Gly Val Thr Ala
 20 35 40 45
 Thr Cys Val Ala Leu Phe Val Val Gly Ile Ala Gly Asn Leu Leu Thr
 50 55 60
 Met Leu Val Val Ser Arg Phe Arg Glu Leu Arg Thr Thr Thr Asn Leu
 65 70 75 80
 25 Tyr Leu Ser Ser Met Ala Phe Ser Asp Leu Leu Ile Phe Leu Cys Met
 85 90 95
 Pro Leu Asp Leu Val Arg Leu Trp Gln Tyr Arg Pro Trp Asn Phe Gly
 100 105 110
 30 Asp Leu Leu Cys Lys Leu Phe Gln Phe Val Ser Glu Ser Cys Thr Tyr
 115 120 125
 Ala Thr Val Leu Thr Ile Thr Ala Leu Ser Val Glu Arg Tyr Phe Ala
 130 135 140
 Ile Cys Phe Pro Leu Arg Ala Lys Val Val Val Thr Lys Gly Arg Val
 145 150 155 160
 35 Lys Leu Val Ile Phe Val Ile Trp Ala Val Ala Phe Cys Ser Ala Gly

168

		165		170		175	
	Pro	Ile	Phe	Val	Leu	Val	Gly
				180			185
	Val	Glu	His	Glu	Asn	Gly	Thr
							190
	Asp	Pro					
5	Trp	Asp	Thr	Asn	Glu	Cys	Arg
				195			200
	Pro	Thr	Glu	Phe	Ala	Val	Arg
							205
	Ser	Gly					
	Leu	Leu	Thr	Val	Met	Val	Trp
				210			215
	Val	Ser	Ser	Ile	Phe	Phe	Phe
							220
	Leu	Pro					
	Val	Phe	Cys	Leu	Thr	Val	Leu
				225			230
	Tyr	Ser	Leu	Ile	Gly	Arg	Lys
							235
	Leu	Trp					
10	Arg	Arg	Arg	Arg	Gly	Asp	Ala
					245		250
	Val	Val	Gly	Ala	Ser	Leu	Arg
							255
	Asp	Gln					
	Asn	His	Lys	Gln	Thr	Lys	Lys
				260			265
	Val	Val	Val	Val	Phe	Ala	Phe
							270
	Ile	Leu	Cys	Trp	Leu	Pro	Phe
				275			280
	His	Val	Gly	Arg	Tyr	Leu	Phe
							285
15	Ser	Phe	Glu	Pro	Gly	Ser	Leu
				290			295
	Glu	Ile	Ala	Gln	Ile	Ser	Gln
							300
	Tyr	Cys					
	Asn	Leu	Val	Ser	Phe	Val	Leu
				305			310
	Phe	Tyr	Leu	Ser	Ala	Ala	Ile
							315
	Asn	Pro					320
20	Ile	Leu	Tyr	Asn	Ile	Met	Ser
				325			330
	Lys	Tyr	Arg	Val	Ala	Val	Phe
							335
	Arg						
	Leu	Leu	Gly	Phe	Glu	Pro	Phe
				340			345
	Ser	Gln	Arg	Lys	Leu	Ser	Thr
							350
	Lys						
25	Asp	Glu	Ser	Ser	Arg	Ala	Trp
				355			360
	Thr	Glu	Ser	Ser	Ile	Asn	Thr
							365

(212) INFORMATION FOR SEQ ID NO:211:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 1842 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: single
 - (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:211:
- | | | | | | | |
|------------|------------|------------|------------|------------|------------|-----|
| ATGCGAGCCC | CGGGCGCGCT | TCTCGCCCGC | ATGTCGCGGC | TACTGCTTCT | GCTACTGCTC | 60 |
| AAGGTGTCTG | CCTCTTCTGC | CCTCGGGGTC | GCCCCGCGT | CCAGAAACGA | AACTTGTCTG | 120 |
| GGGGAGAGCT | GTGCACCTAC | AGTGATCCAG | CGCCGCGGCA | GGGACGCGTG | GGGACCGGGA | 180 |

	AATTCTGCAA	GAGACGTTCT	GCGAGCCCGA	GCACCCAGGG	AGGAGCAGGG	GGCAGCGTTT	240
	CTTGCCGGAC	CCTCTCGGGA	CCTGCCGGCG	GCCCCGGGCC	GTGACCCGGC	TGCAGGCAGA	300
	GGGCGGAGG	CGTCGGCAGC	CGACCCCGCG	GGACCTCCAA	CCAGGCCACC	TGGCCCCCTGG	360
	AGGTGGAAG	GTGCTCGGGG	TCAGGAGCCT	TCTGAAACTT	TGGGGAGAGG	GAACCCACAG	420
5	GCCCTCCAGC	TCTTCCTTCA	GATCTCAGAG	GAGGAAGAGA	AGGGTCCCAG	AGGCGCTGGC	480
	ATTTCCGGGC	GTAGCCAGGA	GCAGAGTGTG	AAGACAGTCC	CCGGAGCCAG	CGATCTTTTT	540
	TACTGGCCAA	GGAGAGCCGG	GAAACTCCAG	GGTTCACACC	ACAAGCCCCC	GTCCAAGACG	600
	GCCAATGGAC	TGGCGGGGCA	CGAAGGGTGG	ACAATTGCAC	TCCCGGGCCG	GGCGCTGGCC	660
	CAGAATGGAT	CCTTGGGTGA	AGGAATCCAT	GAGCCTGGGG	GTCCCCGCCG	GGGAAACAGC	720
10	ACGAACCGGC	GTGTGAGACT	GAAGAACCCC	TTCTACCCGC	TCACCCAGGA	GTCTTATGGA	780
	GCCTACGCGG	TCATGTGTCT	GTCCGTGGTG	ATCTTCGGGA	CCGGCATCAT	TGGCAACCTG	840
	GCGTGATGT	GCATCGTGTG	CCACAACCTAC	TACATGCCGA	GCATCTCCAA	CTCCCTCTTG	900
	GCCAACCTGG	CCTTCCTGGA	CTTTCTCATC	ATCTTCTTCT	GCCTTCCGCT	GGTCATCTTC	960
	CACGAGCTGA	CCAAGAAGTG	GCTGCTGGAG	GACTTCTCCT	GCAAGATCGT	GCCCTATATA	1020
15	GAGGTGCGCT	CTCTGGGAGT	CACCACTTTC	ACCTTATGTG	CTCTGTGCAT	AGACCGCTTC	1080
	CGTGCTGCCA	CCAACGTACA	GATGTACTAC	GAAATGATCG	AAAATTGTTC	CTCAACAACCT	1140
	GCCAAACTTG	CTGTTATATG	GGTGGGAGCT	CTATTGTTAG	CACTTCCAGA	AGTTGTTCTC	1200
	CGCCAGCTGA	GCAAGGAGGA	TTTGGGGTTT	AGTGGCCGAG	CTCCGGCAGA	AAGGTGCATT	1260
	ATTAAGATCT	CTCCTGATTT	ACCAGACACC	ATCTATGTTT	TAGCCCTCAC	CTACGACAGT	1320
20	GCGAGACTGT	GGTGGTATTT	TGGCTGTTAC	TTTGTGTTGC	CCACGCTTTT	CACCATCACC	1380
	TGCTCTCTAG	TGACTGCGAG	GAAATCCCG	AAAGCAGAGA	AAGCCTGTAC	CCGAGGGAAT	1440
	AAACGGCAGA	TTCAACTAGA	GAGTCAGATG	AAGTGTACAG	TAGTGGCACT	GACCAATTTA	1500
	TATGGATTTT	GCATTATTCC	TGAAAATATC	TGCAACATTG	TTACTGCCTA	CATGGCTACA	1560
	GGGGTTTCAC	AGCAGACAAT	GGACCTCCTT	AATATCATCA	GCCAGTTCCT	TTTGTTCITT	1620
25	AAGTCTGTGT	TCACCCCACT	CCTCCTTTTC	TGTCTCTGCA	AACCTTTCAG	TCGGGCCTTC	1680
	ATGGAGTGCT	GCTGCTGTGT	CTGTGAGGAA	TGCATTACAG	AGTCTTCAAC	GGTGACCACT	1740
	GATGACAATG	ACAACAGATA	CACCACGGAA	CTCGAATCTT	CGCCTTTCAG	TACCATACGC	1800
	CGTGAAATGT	CCACTTTTGC	TTCTGTGCGA	ACTCATTGCT	GA		1842

170

(213) INFORMATION FOR SEQ ID NO:212:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 613 amino acids

(B) TYPE: amino acid

(C) STRANDEDNESS:

(D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:212:

10 Met Arg Ala Pro Gly Ala Leu Leu Ala Arg Met Ser Arg Leu Leu Leu
 1 5 10 15
 Leu Leu Leu Leu Lys Val Ser Ala Ser Ser Ala Leu Gly Val Ala Pro
 20 25 30
 Ala Ser Arg Asn Glu Thr Cys Leu Gly Glu Ser Cys Ala Pro Thr Val
 35 40 45
 15 Ile Gln Arg Arg Gly Arg Asp Ala Trp Gly Pro Gly Asn Ser Ala Arg
 50 55 60
 Asp Val Leu Arg Ala Arg Ala Pro Arg Glu Glu Gln Gly Ala Ala Phe
 65 70 75 80
 20 Leu Ala Gly Pro Ser Trp Asp Leu Pro Ala Ala Pro Gly Arg Asp Pro
 85 90 95
 Ala Ala Gly Arg Gly Ala Glu Ala Ser Ala Ala Gly Pro Pro Gly Pro
 100 105 110
 Pro Thr Arg Pro Pro Gly Pro Trp Arg Trp Lys Gly Ala Arg Gly Gln
 115 120 125
 25 Glu Pro Ser Glu Thr Leu Gly Arg Gly Asn Pro Thr Ala Leu Gln Leu
 130 135 140
 Phe Leu Gln Ile Ser Glu Glu Glu Glu Lys Gly Pro Arg Gly Ala Gly
 145 150 155 160
 30 Ile Ser Gly Arg Ser Gln Glu Gln Ser Val Lys Thr Val Pro Gly Ala
 165 170 175
 Ser Asp Leu Phe Tyr Trp Pro Arg Arg Ala Gly Lys Leu Gln Gly Ser
 180 185 190
 His His Lys Pro Leu Ser Lys Thr Ala Asn Gly Leu Ala Gly His Glu
 195 200 205
 35 Gly Trp Thr Ile Ala Leu Pro Gly Arg Ala Leu Ala Gln Asn Gly Ser
 210 215 220
 Leu Gly Glu Gly Ile His Glu Pro Gly Gly Pro Arg Arg Gly Asn Ser

171

	225		230		235		240
	Thr	Asn	Arg	Arg	Val	Arg	Leu
				245		250	Phe
						Tyr	Pro
						Leu	Thr
							Gln
							255
5	Glu	Ser	Tyr	Gly	Ala	Tyr	Ala
				260		265	Leu
						Ser	Val
						Val	Ile
							Phe
							270
	Gly	Thr	Gly	Ile	Ile	Gly	Asn
				275		280	Leu
						Ala	Val
						Met	Cys
						Ile	Val
							Cys
							His
							285
	Asn	Tyr	Tyr	Met	Arg	Ser	Ile
		290				295	Ser
						Asn	Ser
						Leu	Leu
						Ala	Ala
						Asn	Leu
							Ala
							300
10	Phe	Trp	Asp	Phe	Leu	Ile	Ile
				310		Phe	Phe
						Cys	Leu
						Pro	Leu
						Val	Ile
							Phe
							320
	His	Glu	Leu	Thr	Lys	Lys	Trp
					325		Leu
						Glu	Asp
						Phe	Ser
						Cys	Lys
							Ile
							335
15	Val	Pro	Tyr	Ile	Glu	Val	Ala
				340		Ser	Leu
						Gly	Val
						Thr	Thr
						Phe	Thr
							Leu
							350
	Cys	Ala	Leu	Cys	Ile	Asp	Arg
				355		Phe	Arg
						Ala	Ala
						Thr	Asn
						Val	Gln
							Met
							365
	Tyr	Tyr	Glu	Met	Ile	Glu	Asn
				370		Cys	Ser
						Ser	Ser
						Thr	Thr
						Ala	Lys
							Leu
							Ala
							380
20	Val	Ile	Trp	Val	Gly	Ala	Leu
				385		Leu	Leu
						Ala	Leu
						Pro	Glu
						Val	Val
							Leu
							400
	Arg	Gln	Leu	Ser	Lys	Glu	Asp
				405		Leu	Gly
						Phe	Ser
						Gly	Arg
						Ala	Pro
							Ala
							415
25	Glu	Arg	Cys	Ile	Ile	Lys	Ile
				420		Ser	Pro
						Asp	Leu
						Pro	Asp
						Thr	Ile
							Tyr
							430
	Val	Leu	Ala	Leu	Thr	Tyr	Asp
				435		Ser	Ala
						Arg	Leu
						Trp	Trp
						Tyr	Phe
							Gly
							445
	Cys	Tyr	Phe	Cys	Leu	Pro	Thr
				450		Leu	Phe
						Thr	Ile
						Thr	Cys
							Ser
							Leu
							Val
							460
30	Thr	Ala	Arg	Lys	Ile	Arg	Lys
				465		Ala	Glu
						Lys	Ala
						Cys	Thr
						Arg	Gly
							Asn
							480
	Lys	Arg	Gln	Ile	Gln	Leu	Glu
				485		Ser	Gln
						Lys	Cys
						Thr	Val
							Ala
							495
35	Leu	Thr	Ile	Leu	Tyr	Gly	Phe
				500		Cys	Ile
						Pro	Glu
						Asn	Ile
							Cys
							Asn
							510
	Ile	Val	Thr	Ala	Tyr	Met	Ala
				515		Thr	Gly
						Val	Ser
						Gln	Gln
						Thr	Met
							Asp
							525

172

Leu Leu Asn Ile Ile Ser Gln Phe Leu Leu Phe Phe Lys Ser Cys Val
 530 535 540
 Thr Pro Val Leu Leu Phe Cys Leu Cys Lys Pro Phe Ser Arg Ala Phe
 545 550 555 560
 5 Met Glu Cys Cys Cys Cys Cys Glu Glu Cys Ile Gln Lys Ser Ser
 565 570 575
 Thr Val Thr Ser Asp Asp Asn Asp Asn Glu Tyr Thr Thr Glu Leu Glu
 580 585 590
 10 Leu Ser Pro Phe Ser Thr Ile Arg Arg Glu Met Ser Thr Phe Ala Ser
 595 600 605
 Val Gly Thr His Cys
 610
 (214) INFORMATION FOR SEQ ID NO:213:
 (i) SEQUENCE CHARACTERISTICS:
 15 (A) LENGTH: 1248 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
 (ii) MOLECULE TYPE: DNA (genomic)
 20 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:213:
 ATGGTTTTG CTCACAGAAT GGATAACAGC AAGCCACATT TGATTATTC TACACTTCTG 60
 GTGCCCCCTCC AAAACCGCAG CTGCACTGAA ACAGCCACAC CTCTGCCAAG CCAATACCTG 120
 ATGGAATTAA GTGAGGAGCA CAGTTGGATG AGCAACCAA CAGACCTTCA CTATGTGCTG 180
 AAACCCGGGG AAGTGGCCAC AGCCAGCATC TTCITTGGGA TTCTGTG3TT GTTTTCTATC 240
 25 TTCGCAATT CCTGTGTTTG TTTGGTCATC CATAGGAGTA GGAGGACTCA GTCTACCACC 300
 AACTACTTTG TGGTCTCCAT GGCATGTGCT GACCTTCTCA TCAGCGTTGC CAGCAGCGCT 360
 TTCGTCTGTC TCCAGTTTAC CACTGGAAGG TGGACGCTGG GTAGTGCAAC GTGCAAGGTT 420
 GTGCGATATT TTCAATATCT CACTCCAGGT GTCCAGATCT ACGTTCTCCT TCCCATCTGC 480
 ATAGACCGGT TCTACACCAT CGTCTATCCT CTGAGCTTCA AGGTGTCCAG AGAAAAAGCC 540
 30 AAGAAAAATG ATTGCGGCATC GTGGATCTTT GATGCAGGCT TTGTGACCCC TGTGCTCTTT 600
 TTCTATGGCT CCAACTGGGA CAGTCATTGT AACTATTTC TCCCTCTCT TGGGAAGGC 660
 ACTGCCTACA CTGTCATCCA CTTCCTGGTG GGCCTTTGTA TTCCATCTGT CCTCATAATT 720
 TTATTTTACC AAAAGGTCAT AAAATATATT TGGAGAATAG GCACAGATGG CCGAACGGTG 780

173

AGGAGGACAA TGAACATGT CCCTCGGACA AAAGTGA AAA CTAAAAAGAT GTTCCTCATT 840
 TTAATCTGT TGT TTTTGTCT CTCCTGGCTG CCTTTTCATG TAGCTCAGCT ATGGCACCCC 900
 CATGAACAAG ACTATAAGAA AAGTCCCTT GTTTTCACAG CTATCACATG GATATCCTTT 960
 AGTTCCTCAG CCTCTAAACC TACTCTGTAT TCAATTTATA ATGCCAATTT TCGGAGAGGG 1020
 5 ATGAAAGAGA CTTTTTGCAT GTCTCTATG AAATGTTACC GAAGCAATGC CTATACTATC 1080
 ACAACAAGTT CAAGGATGGC CAAAAA AAC TACGTTGGCA TTTCAGAAAT CCTTCCATG 1140
 GCCAAACTA TTACCAAAGA CTCGATCTAT GACTCATTTG ACAGAGAAGC CAAGGAAAAA 1200
 AAGCTTGCTT GGCCCAATTA CTCAAATCCA CCAATACTT TTGTCTAA 1248

(215) INFORMATION FOR SEQ ID NO:214:

10

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 415 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

15

- (ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:214:

Met	Val	Phe	Ala	His	Arg	Met	Asp	Asn	Ser	Lys	Pro	His	Leu	Ile	Ile	1	5	10	15
Pro	Thr	Leu	Leu	Val	Pro	Leu	Gln	Asn	Arg	Ser	Cys	Thr	Glu	Thr	Ala	20	25	30	
Thr	Pro	Leu	Pro	Ser	Gln	Tyr	Leu	Met	Glu	Leu	Ser	Glu	Glu	His	Ser	35	40	45	
Trp	Met	Ser	Asn	Gln	Thr	Asp	Leu	His	Tyr	Val	Leu	Lys	Pro	Gly	Glu	50	55	60	
Val	Ala	Thr	Ala	Ser	Ile	Phe	Phe	Gly	Ile	Leu	Trp	Leu	Phe	Ser	Ile	65	70	75	80
Phe	Gly	Asn	Ser	Leu	Val	Cys	Leu	Val	Ile	His	Arg	Ser	Arg	Arg	Thr	85	90	95	
Gln	Ser	Thr	Thr	Asn	Tyr	Phe	Val	Val	Ser	Met	Ala	Cys	Ala	Asp	Leu	100	105	110	
Leu	Ile	Ser	Val	Ala	Ser	Thr	Pro	Phe	Val	Leu	Leu	Gln	Phe	Thr	Thr	115	120	125	
Gly	Arg	Trp	Thr	Leu	Gly	Ser	Ala	Thr	Cys	Lys	Val	Val	Arg	Tyr	Phe	130	135	140	

174

Gln Tyr Leu Thr Pro Gly Val Gln Ile Tyr Val Leu Leu Ser Ile Cys
 145 150 155 160
 Ile Asp Arg Phe Tyr Thr Ile Val Tyr Pro Leu Ser Phe Lys Val Ser
 165 170 175
 5 Arg Glu Lys Ala Lys Lys Met Ile Ala Ala Ser Trp Ile Phe Asp Ala
 180 185 190
 Gly Phe Val Thr Pro Val Leu Phe Phe Tyr Gly Ser Asn Trp Asp Ser
 195 200 205
 10 His Cys Asn Tyr Phe Leu Pro Ser Ser Trp Glu Gly Thr Ala Tyr Thr
 210 215 220
 Val Ile His Phe Leu Val Gly Phe Val Ile Pro Ser Val Leu Ile Ile
 225 230 235 240
 Leu Phe Tyr Gln Lys Val Ile Lys Tyr Ile Trp Arg Ile Gly Thr Asp
 245 250 255
 15 Gly Arg Thr Val Arg Arg Thr Met Asn Ile Val Pro Arg Thr Lys Val
 260 265 270
 Lys Thr Lys Lys Met Phe Leu Ile Leu Asn Leu Leu Phe Leu Leu Ser
 275 280 285
 20 Trp Leu Pro Phe His Val Ala Gln Leu Trp His Pro His Glu Gln Asp
 290 295 300
 Tyr Lys Lys Ser Ser Leu Val Phe Thr Ala Ile Thr Trp Ile Ser Phe
 305 310 315 320
 Ser Ser Ser Ala Ser Lys Pro Thr Leu Tyr Ser Ile Tyr Asn Ala Asn
 325 330 335
 25 Phe Arg Arg Gly Met Lys Glu Thr Phe Cys Met Ser Ser Met Lys Cys
 340 345 350
 Tyr Arg Ser Asn Ala Tyr Thr Ile Thr Thr Ser Ser Arg Met Ala Lys
 355 360 365
 30 Lys Asn Tyr Val Gly Ile Ser Glu Ile Pro Ser Met Ala Lys Thr Ile
 370 375 380
 Thr Lys Asp Ser Ile Tyr Asp Ser Phe Asp Arg Glu Ala Lys Glu Lys
 385 390 395 400
 Lys Leu Ala Trp Pro Ile Asn Ser Asn Pro Pro Asn Thr Phe Val
 405 410 415

35 (216) INFORMATION FOR SEQ ID NO:215:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 1842 base pairs

175

(B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

5 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:215:

	ATGGGGCCCA	CCCTAGCCGT	TCCCACCCCC	TATGGCTGTA	TTGGCTGTAA	GCTACCCAG	60
	CCAGAATACC	CACCGGCTCT	AATCATCTTT	ATGTTCTGCG	CGATGGTTAT	CACCATCGTT	120
	GTAGACCTAA	TCGGCAACTC	CATGGTCATT	TTGGCTGTGA	CGAAGAACAA	GAAGCTCCGG	180
	AATTCTGGCA	ACATCTTCGT	GGTCAGTCTC	TCTGTGGCCG	ATATGCTGGT	GGCCATCTAC	240
10	CCATACCCCT	TGATGCTGCA	TGCCATGTCC	ATTGGGGGCT	GGGATCTGAG	CCAGTTACAG	300
	TGCCAGATGG	TCGGGTTTCA	CACAGGGCTG	AGTGTGGTCG	GCTCCATCTT	CAACATCGTG	360
	GCAATCGCTA	TCAACCGTTA	CTGCTACATC	TGCCACAGCC	TCCAGTACGA	ACGGATCTTC	420
	AGTGTGCGCA	ATACCTGCAT	CTACCTGGTC	ATCACCTGGA	TCATGACCGT	CCTGGCTGTC	480
	CTGCCCAACA	TGTACATTGG	CACCATCGAG	TACGATCCTC	GCACCTACAC	CTGCATCTTC	540
15	AACTATCTGA	ACAACCCTGT	CTTCACTGTT	ACCATCGTCT	GCATCCACTT	CGTCTCCCT	600
	CTCCTCATCG	TGGGTTTCTG	CTACGTGAGG	ATCTGGACCA	AAGTGCTGGC	GGCCCGTGAC	660
	CCTGCAGGGC	AGAATCCTGA	CAACCAACTT	GCTGAGGTTT	GCAATAAACT	AACCATGTTT	720
	GTGATCTTCC	TCCTCTTTGC	AGTGTGCTGG	TGCCCTATCA	ACGTGCTCAC	TGTCCTGGTG	780
	GCTGTGAGTC	CGAAGGAGAT	GGCAGGCAAG	ATCCCCAACT	GGCTTTATCT	TGCAGCCTAC	840
20	TTCATAGCCT	ACTTCAACAG	CTGCCTCAAC	GCTGTGATCT	ACGGGCTCCT	CAATGAGAAT	900
	TTCCGAAGAG	AATACTGGAC	CATCTTCCAT	GCTATGCGGC	ACCCTATCAT	ATTCTTCTCT	960
	GGCCTCATCA	GTGATATTGG	TGAGATGCAG	GAGGCCCGTA	CCCTGGCCCG	CGCCCGTGCC	1020
	CATGCTCGCG	ACCAAGCTCG	TGAACAAGAC	CGTGCCCATG	CCTGTCTCTG	TGTGGAGGAA	1080
	ACCCCGATGA	ATGTCCGGAA	TGTTCCATTA	CCTGGTGATG	CTGCAGCTGG	CCACCCCGAC	1140
25	CGTGCTCTG	GCCACCTTAA	GCCCCATTCC	AGATCCTCCT	CTGCCTATCG	CAAATCTGCC	1200
	TCTACCACCC	ACAAGTCTGT	CTTTAGCCAC	TCCAAGGCTG	CCTCTGGTCA	CCTCAAGCCT	1260
	GTCTCTGGCC	ACTCCAAGCC	TGCCCTCTGGT	CACCCCAAGT	CTGCCACTGT	CTACCCCTAAG	1320
	CCTGCCTCTG	TCCATTTCAA	GGCTGACTCT	GTCCATTTC	AGGGTGACTC	TGTCCAATTC	1380
	AAGCCTGACT	CTGTTCATTT	CAAGCCTGCT	TCCAGCAACC	CCAAGCCCAT	CACTGGCCAC	1440

176

CATGTCCTCTG CTGGCAGCCA CTCCAAGTCT GCCTTCAATG CTGCCACCAG CCACCCCTAAA 1500
 CCCATCAAGC CAGCTACCAG CCATGCTGAG CCCACCACTG CTGACTATATCC CAAGCCTGCC 1560
 ACTACCAGCC ACCCTAAGCC CGCTGCTGCT GACAACCCCTG AGCTCTCTGC CTCCCATTGC 1620
 CCCGAGATCC CTGCCATTGC CCACCCCTGTG TCTGACGACA GTGACCTCCC TGAGTCGGCC 1680
 5 TCTAGCCCTG CCGCTGGGCC CACCAAGCCT GCTGCCAGCC AGCTGGAGTC TGACACCATC 1740
 GCTGACCTTC CTGACCCCTAC TGTAGTCACT ACCAGTACCA ATGATTACCA TGATGTCGTG 1800
 GTTGTGATG TTGAAGATGA TCCTGATGAA ATGGCTGTGT GA 1842

(217) INFORMATION FOR SEQ ID NO:216:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 613 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:216:

Met Gly Pro Thr Leu Ala Val Pro Thr Pro Tyr Gly Cys Ile Gly Cys
 1 5 10 15
 Lys Leu Pro Gln Pro Glu Tyr Pro Pro Ala Leu Ile Ile Phe Met Phe
 20 25 30
 Cys Ala Met Val Ile Thr Ile Val Val Asp Leu Ile Gly Asn Ser Met
 35 40 45
 Val Ile Leu Ala Val Thr Lys Asn Lys Lys Leu Arg Asn Ser Gly Asn
 50 55 60
 Ile Phe Val Val Ser Leu Ser Val Ala Asp Met Leu Val Ala Ile Tyr
 65 70 75 80
 Pro Tyr Pro Leu Met Leu His Ala Met Ser Ile Gly Gly Trp Asp Leu
 85 90 95
 Ser Gln Leu Gln Cys Gln Met Val Gly Phe Ile Thr Gly Leu Ser Val
 100 105 110
 Val Gly Ser Ile Phe Asn Ile Val Ala Ile Ala Ile Asn Arg Tyr Cys
 115 120 125
 Tyr Ile Cys His Ser Leu Gln Tyr Glu Arg Ile Phe Ser Val Arg Asn
 130 135 140
 Thr Cys Ile Tyr Leu Val Ile Thr Trp Ile Met Thr Val Leu Ala Val
 145 150 155 160

177

Leu Pro Asn Met Tyr Ile Gly Thr Ile Glu Tyr Asp Pro Arg Thr Tyr
 165 170 175
 Thr Cys Ile Phe Asn Tyr Leu Asn Asn Pro Val Phe Thr Val Thr Ile
 180 185 190
 5 Val Cys Ile His Phe Val Leu Pro Leu Leu Ile Val Gly Phe Cys Tyr
 195 200 205
 Val Arg Ile Trp Thr Lys Val Leu Ala Ala Arg Asp Pro Ala Gly Gln
 210 215 220
 10 Asn Pro Asp Asn Gln Leu Ala Glu Val Arg Asn Lys Leu Thr Met Phe
 225 230 235 240
 Val Ile Phe Leu Leu Phe Ala Val Cys Trp Cys Pro Ile Asn Val Leu
 245 250 255
 Thr Val Leu Val Ala Val Ser Pro Lys Glu Met Ala Gly Lys Ile Pro
 260 265 270
 15 Asn Trp Leu Tyr Leu Ala Ala Tyr Phe Ile Ala Tyr Phe Asn Ser Cys
 275 280 285
 Leu Asn Ala Val Ile Tyr Gly Leu Leu Asn Glu Asn Phe Arg Arg Glu
 290 295 300
 20 Tyr Trp Thr Ile Phe His Ala Met Arg His Pro Ile Ile Phe Phe Ser
 305 310 315 320
 Gly Leu Ile Ser Asp Ile Arg Glu Met Gln Glu Ala Arg Thr Leu Ala
 325 330 335
 Arg Ala Arg Ala His Ala Arg Asp Gln Ala Arg Glu Gln Asp Arg Ala
 340 345 350
 25 His Ala Cys Pro Ala Val Glu Glu Thr Pro Met Asn Val Arg Asn Val
 355 360 365
 Pro Leu Pro Gly Asp Ala Ala Ala Gly His Pro Asp Arg Ala Ser Gly
 370 375 380
 30 His Pro Lys Pro His Ser Arg Ser Ser Ser Ala Tyr Arg Lys Ser Ala
 385 390 395 400
 Ser Thr His His Lys Ser Val Phe Ser His Ser Lys Ala Ala Ser Gly
 405 410 415
 His Leu Lys Pro Val Ser Gly His Ser Lys Pro Ala Ser Gly His Pro
 420 425 430
 35 Lys Ser Ala Thr Val Tyr Pro Lys Pro Ala Ser Val His Phe Lys Ala
 435 440 445
 Asp Ser Val His Phe Lys Gly Asp Ser Val His Phe Lys Pro Asp Ser

178

450 455 460
 Val His Phe Lys Pro Ala Ser Ser Asn Pro Lys Pro Ile Thr Gly His
 465 470 475 480
 5 His Val Ser Ala Gly Ser His Ser Lys Ser Ala Phe Asn Ala Ala Thr
 485 490 495
 Ser His Pro Lys Pro Ile Lys Pro Ala Thr Ser His Ala Glu Pro Thr
 500 505 510
 Thr Ala Asp Tyr Pro Lys Pro Ala Thr Thr Ser His Pro Lys Pro Ala
 515 520 525
 10 Ala Ala Asp Asn Pro Glu Leu Ser Ala Ser His Cys Pro Glu Ile Pro
 530 535 540
 Ala Ile Ala His Pro Val Ser Asp Asp Ser Asp Leu Pro Glu Ser Ala
 545 550 555 560
 15 Ser Ser Pro Ala Ala Gly Pro Thr Lys Pro Ala Ala Ser Gln Leu Glu
 565 570 575
 Ser Asp Thr Ile Ala Asp Leu Pro Asp Pro Thr Val Val Thr Thr Ser
 580 585 590
 Thr Asn Asp Tyr His Asp Val Val Val Asp Val Glu Asp Asp Pro
 595 600 605
 20 Asp Glu Met Ala Val
 610
 (218) INFORMATION FOR SEQ ID NO:217:
 (i) SEQUENCE CHARACTERISTICS:
 25 (A) LENGTH: 1854 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
 (ii) MOLECULE TYPE: DNA (genomic)
 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:217:
 30 ATGGGGCCCC CCCTAGCGGT TCCCACCCCC TATGGCTGTA TTGGCTGTAA GCTACCCAG 60
 CCAGAATACC CACCGGCTCT AATCATCTTT ATGTTCTGCG CGATGGTTAT CACCATCGTT 120
 GTAGACCTAA TCGGCAACTC CATGGTCATT TTGGCTGTGA CGAAGAACAA GAAGCTCCGG 180
 AATTCTGGCA ACATCTTCGT GGTCACTCTC TCTGTGGCCG ATATGCTGGT GGCCATCTAC 240
 CCATACCCTT TGATGCTGCA TGCCATGTCC ATTGGGGGCT GGGATCTGAG CCAGTTACAG 300
 35 TGCCAGATGG TCGGGTTCAT CACAGGGCTG AGTGTGGTCG GCTCCATCTT CAACATCGTG 360

	GCAATCGCTA TCAACCGTTA CTGCTACATC TGCCACAGCC TCCAGTACGA ACGGATCTTC	420
	AGTGTGCGCA ATACCTGTCAT CTACCTGGTC ATCACCTGGA TCATGACCGT CCTGGCTGTC	480
	CTGCCCCAACA TGTACATTGG CACCATCGAG TACGATCCTC GCACCTACAC CTGCATCTTC	540
	AACTATCTGA ACAACCCGTG CTTCAGTGT ACCATCGTCT GCATCCACTT CGTCTCCCT	600
5	CTCCTCATCG TGGGTTTCTG CTACGTGAGG ATCTGGACCA AAGTGCTGGC GGCCCGTGAC	660
	CCTGCAGGGC AGAATCCTGA CAACCAACTT GCTGAGGTTT GCAATAAACT AACCATGTTT	720
	GTGATCTTCC TCCTCTTTGC AGTGTGCTGG TGCCCTATCA ACGTGCTCAC TGTCTTGCTG	780
	GCTGTCAATC CGAAGGAGAT GGCAGGCAAG ATCCCAACTT GGCCTTATCT TGCAGCCTAC	840
	TTCATAGCCT ACTTCAACAG CTGCCTCAAC GCTGTGATCT ACGGGCTCCT CAATGAGAAT	900
10	TTCCGAAGAG AATACTGGAC CATCTTCCAT GCTATGCGGC ACCCTATCAT ATTCTTCTCT	960
	GGCCTCATCA GTGATATTGC TGAGATGCAG GAGGCCCGTA CCCTGGCCCG CGCCCGTGCC	1020
	CATGCTCGCG ACCAAGCTCG TGAACAAGAC CGTGCCCATG CCTGTCTCTG TGTGGAGGAA	1080
	ACCCCGATGA ATGTCCGGAA TGTTCATTA CCTGGTGATG CTGCAGCTGG CCACCCCGAC	1140
	CGTGCCCTCG GCCACCTTAA GCCCCATTCC AGATCCTCCT CTGCCTATCG CAAATCTGCC	1200
15	TCTACCCACC ACAAGTCTGT CTTTAGCCAC TCCAAGGCTG CCTCTGGTCA CCTCAAGCCT	1260
	GTCTCTGGCC ACTCCAAGCC TGCCTCTGGT CACCCCAAGT CTGCCACTGT CTACCTTAAG	1320
	CCTGCCTCTG TCCATTTCAG GGCTGACTCT GTCCATTTCAG AGGGTGACTC TGTCCATTTC	1380
	AAGCCTGACT CTGTTTCATT CAAGCCTGCT TCCAGCAACC CCAAGCCCAT CACTGGCCAC	1440
	CATGTCTCTG CTGGCAGCCA CTCCAAGTCT GCCTTCAGTG CTGCCACCAG CCACCCATAA	1500
20	CCCACCACCT GCCACATCAA GCCAGCTACC AGCCATGCTG AGCCACCACG TGCTGACTAT	1560
	CCCAAGCCTG CCACTACCAG CCACCTTAAG CCCACTGCTG CTGACAACCC TGAGCTCTCT	1620
	GCCTCCCATG GCCCGAGAT CCCTGCCATT GCCCACCCTG TGTCTGACGA CAGTGACCTC	1680
	CCTGAGTCGG CCTCTAGCCC TGCCGCTGGG CCCACCAAGC TGTCTGCCAG CCAGCTGGAG	1740
	TCTGACACCA TCGCTGACCT TCCTGACCCT ACTGTAGTCA CTACAGTAC CAATGATTAC	1800
25	CATGATGTCT TGTTGTGTA TGTTGAAGAT GATCCTGATG AAATGGCTGT GTGA	1854

(219) INFORMATION FOR SEQ ID NO:218:

(1) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 617 amino acids

(B) TYPE: amino acid

180

(C) STRANDEDNESS:

(D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:218:

5 Met Gly Pro Thr Leu Ala Val Pro Thr Pro Tyr Gly Cys Ile Gly Cys
 1 5 10 15

Lys Leu Pro Gln Pro Glu Tyr Pro Pro Ala Leu Ile Ile Phe Met Phe
 20 25 30

10 Cys Ala Met Val Ile Thr Ile Val Val Asp Leu Ile Gly Asn Ser Met
 35 40 45

Val Ile Leu Ala Val Thr Lys Asn Lys Lys Leu Arg Asn Ser Gly Asn
 50 55 60

Ile Phe Val Val Ser Leu Ser Val Ala Asp Met Leu Val Ala Ile Tyr
 65 70 75 80

15 Pro Tyr Pro Leu Met Leu His Ala Met Ser Ile Gly Gly Trp Asp Leu
 85 90 95

Ser Gln Leu Gln Cys Gln Met Val Gly Phe Ile Thr Gly Leu Ser Val
 100 105 110

20 Val Gly Ser Ile Phe Asn Ile Val Ala Ile Ala Ile Asn Arg Tyr Cys
 115 120 125

Tyr Ile Cys His Ser Leu Gln Tyr Glu Arg Ile Phe Ser Val Arg Asn
 130 135 140

Thr Cys Ile Tyr Leu Val Ile Thr Trp Ile Met Thr Val Leu Ala Val
 145 150 155 160

25 Leu Pro Asn Met Tyr Ile Gly Thr Ile Glu Tyr Asp Pro Arg Thr Tyr
 165 170 175

Thr Cys Ile Phe Asn Tyr Leu Asn Asn Pro Val Phe Thr Val Thr Ile
 180 185 190

30 Val Cys Ile His Phe Val Leu Pro Leu Leu Ile Val Gly Phe Cys Tyr
 195 200 205

Val Arg Ile Trp Thr Lys Val Leu Ala Ala Arg Asp Pro Ala Gly Gln
 210 215 220

Asn Pro Asp Asn Gln Leu Ala Glu Val Arg Asn Lys Leu Thr Met Phe
 225 230 235 240

35 Val Ile Phe Leu Leu Phe Ala Val Cys Trp Cys Pro Ile Asn Val Leu
 245 250 255

181

Thr Val Leu Val Ala Val Ser Pro Lys Glu Met Ala Gly Lys Ile Pro
 260 265 270
 Asn Trp Leu Tyr Leu Ala Ala Tyr Phe Ile Ala Tyr Phe Asn Ser Cys
 275 280 285
 5 Leu Asn Ala Val Ile Tyr Gly Leu Leu Asn Glu Asn Phe Arg Arg Glu
 290 295 300
 Tyr Trp Thr Ile Phe His Ala Met Arg His Pro Ile Ile Phe Phe Ser
 305 310 315 320
 10 Gly Leu Ile Ser Asp Ile Arg Glu Met Gln Glu Ala Arg Thr Leu Ala
 325 330 335
 Arg Ala Arg Ala His Ala Arg Asp Gln Ala Arg Glu Gln Asp Arg Ala
 340 345 350
 His Ala Cys Pro Ala Val Glu Glu Thr Pro Met Asn Val Arg Asn Val
 355 360 365
 15 Pro Leu Pro Gly Asp Ala Ala Ala Gly His Pro Asp Arg Ala Ser Gly
 370 375 380
 His Pro Lys Pro His Ser Arg Ser Ser Ser Ala Tyr Arg Lys Ser Ala
 385 390 395 400
 20 Ser Thr His His Lys Ser Val Phe Ser His Ser Lys Ala Ala Ser Gly
 405 410 415
 His Leu Lys Pro Val Ser Gly His Ser Lys Pro Ala Ser Gly His Pro
 420 425 430
 Lys Ser Ala Thr Val Tyr Pro Lys Pro Ala Ser Val His Phe Lys Ala
 435 440 445
 25 Asp Ser Val His Phe Lys Gly Asp Ser Val His Phe Lys Pro Asp Ser
 450 455 460
 Val His Phe Lys Pro Ala Ser Ser Asn Pro Lys Pro Ile Thr Gly His
 465 470 475 480
 30 His Val Ser Ala Gly Ser His Ser Lys Ser Ala Phe Ser Ala Ala Thr
 485 490 495
 Ser His Pro Lys Pro Thr Thr Gly His Ile Lys Pro Ala Thr Ser His
 500 505 510
 Ala Glu Pro Thr Thr Ala Asp Tyr Pro Lys Pro Ala Thr Thr Ser His
 515 520 525
 35 Pro Lys Pro Thr Ala Ala Asp Asn Pro Glu Leu Ser Ala Ser His Cys
 530 535 540
 Pro Glu Ile Pro Ala Ile Ala His Pro Val Ser Asp Asp Ser Asp Leu

182

[illegible]

183

TTGCTGCTCA CTGCTGTTTG GCTGCCCAAA GTCTCCCTGC TGGCAAACCC TGTCTCTTTT 960
 CITACTGTGA ACAAATCTGT CCGCAAGTGC TTGATAGGGA CCCTGGTGCA ACTACACCAC 1020
 CGGTACAGTC GCCGTAATGT GGTCAGTACA GGGAGTGGCA TGGCTGAGGC CAGCCTGGAA 1080
 CCCAGCATAC GCTCGGGTAG CCAGCTCCTG GAGATGTTC ACATTGGGCA GCAGCAGATC 1140
 5 TTTAAGCCCA CAGAGGATGA GGAAGAGAGT GAGGCCAAGT ACATTGGGCTC AGTGACTTTC 1200
 CAGGCCAAGG AGATATTTAG CACCTGCCTG GAGGGAGAGC AGGGGCCACA GTTTGCGCCC 1260
 TCTGCCCCAC CCCTGAGCAC AGTGGACTCT GTATCCCAGG TGGCACCCGC AGCCCCGTGT 1320
 GAACCTGAAA CATTCCCTGA TAAGTATTCC CTGCAGTTTG GCTTTGGGCC TTTTGAGTTG 1380
 CCTCCTCAGT GGTCTCAGA GACCCGAAAC AGCAAGAAGC GGCTGCTTCC CCCTTGGGC 1440
 10 AACCCCCAG AAGAGCTGAT CCAGACAAAG GTGCCCAAGG TAGGCAGGCT GGAGCGGAAG 1500
 ATGAGCAGAA ACAATAAAGT GAGCATTTTT CCAAAGGTGG ATTCCTAG 1548

(221) INFORMATION FOR SEQ ID NO:220:

(i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 515 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:220:

20 Met Gly His Asn Gly Ser Trp Ile Ser Pro Asn Ala Ser Glu Pro His
 1 5 10 15
 Asn Ala Ser Gly Ala Glu Ala Ala Gly Val Asn Arg Ser Ala Leu Gly
 20 25 30
 25 Glu Phe Gly Glu Ala Gln Leu Tyr Arg Gln Phe Thr Thr Thr Val Gln
 35 40 45
 Val Val Ile Phe Ile Gly Ser Leu Leu Gly Asn Phe Met Val Leu Trp
 50 55 60
 Ser Thr Cys Arg Thr Thr Val Phe Lys Ser Val Thr Asn Arg Phe Ile
 65 70 75 80
 30 Lys Asn Leu Ala Cys Ser Gly Ile Cys Ala Ser Leu Val Cys Val Pro
 85 90 95
 Phe Asp Ile Ile Leu Ser Thr Ser Pro His Cys Cys Trp Trp Ile Tyr
 100 105 110

184

Thr Met Leu Phe Cys Lys Val Val Lys Phe Leu His Lys Val Phe Cys
 115 120 125
 Ser Val Thr Ile Leu Ser Phe Pro Ala Ile Ala Leu Asp Arg Tyr Tyr
 130 135 140
 5 Ser Val Leu Tyr Pro Leu Glu Arg Lys Ile Ser Asp Ala Lys Ser Arg
 145 150 155 160
 Glu Leu Val Met Tyr Ile Trp Ala His Ala Val Val Ala Ser Val Pro
 165 170 175
 10 Val Phe Ala Val Thr Asn Val Ala Asp Ile Tyr Ala Thr Ser Thr Cys
 180 185 190
 Thr Glu Val Trp Ser Asn Ser Leu Gly His Leu Val Tyr Val Leu Val
 195 200 205
 Tyr Asn Ile Thr Thr Val Ile Val Pro Val Val Val Phe Leu Phe
 210 215 220
 15 Leu Ile Leu Ile Arg Arg Ala Leu Ser Ala Ser Gln Lys Lys Lys Val
 225 230 235 240
 Ile Ile Ala Ala Leu Arg Thr Pro Gln Asn Thr Ile Ser Ile Pro Tyr
 245 250 255
 20 Ala Ser Gln Arg Glu Ala Glu Leu Lys Ala Thr Leu Leu Ser Met Val
 260 265 270
 Met Val Phe Ile Leu Cys Ser Val Pro Tyr Ala Thr Leu Val Val Tyr
 275 280 285
 Gln Thr Val Leu Asn Val Pro Asp Thr Ser Val Phe Leu Leu Leu Thr
 290 295 300
 25 Ala Val Trp Leu Pro Lys Val Ser Leu Leu Ala Asn Pro Val Leu Phe
 305 310 315 320
 Leu Thr Val Asn Lys Ser Val Arg Lys Cys Leu Ile Gly Thr Leu Val
 325 330 335
 30 Gln Leu His His Arg Tyr Ser Arg Arg Asn Val Val Ser Thr Gly Ser
 340 345 350
 Gly Met Ala Glu Ala Ser Leu Glu Pro Ser Ile Arg Ser Gly Ser Gln
 355 360 365
 Leu Leu Glu Met Phe His Ile Gly Gln Gln Gln Ile Phe Lys Pro Thr
 370 375 380
 35 Glu Asp Glu Glu Glu Ser Glu Ala Lys Tyr Ile Gly Ser Ala Asp Phe
 385 390 395 400
 Gln Ala Lys Glu Ile Phe Ser Thr Cys Leu Glu Gly Glu Gln Gly Pro

185

405 410 415

Gln Phe Ala Pro Ser Ala Pro Pro Leu Ser Thr Val Asp Ser Val Ser
420 425 430

5 Gln Val Ala Pro Ala Ala Pro Val Glu Pro Glu Thr Phe Pro Asp Lys
435 440 445

Tyr Ser Leu Gln Phe Gly Phe Gly Pro Phe Glu Leu Pro Pro Gln Trp
450 455 460

Leu Ser Glu Thr Arg Asn Ser Lys Lys Arg Leu Leu Pro Pro Leu Gly
465 470 475 480

10 Asn Thr Pro Glu Glu Leu Ile Gln Thr Lys Val Pro Lys Val Gly Arg
485 490 495

Val Glu Arg Lys Met Ser Arg Asn Asn Lys Val Ser Ile Phe Pro Lys
500 505 510

15 Val Asp Ser
515

(222) INFORMATION FOR SEQ ID NO:221:

(i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 1164 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:221:

ATGAATCGGC ACCATCTGCA GGATCACTTT CTGGAATAG ACAAGAAGAA CTGCTGTGTG 60

25 TTCCGAGATG ACTTCATGCG CAAGGTGTTG CCGCCGGTGT TGGGGCTGGA GTTTATCTTT 120

GGGCTTCTGG GCAATGGCCT TGCCCTGTGG ATTTTCTGTT TCCACCTCAA GTCCTGGAAA 180

TCCAGCCGGA TTTTCTGTT CAACCTGGCA GTAGCTGACT TTCTACTGAT CATCTGCCTG 240

CCGTTCTGTA TGGACTACTA TGTGCGGCGT TCAGACTGGA AGTTTGGGGA CATCCCTTGC 300

CGGCTGGTGC TCTTCATGTT TGCCATGAAC CGCCAGGGCA GCATCATCTT CCTCACGGTG 360

30 GTGCGCGTAG ACAGGTATTT CCGGGTGGTC CATCCCCACC ACGCCCTGAA CAAGATCTCC 420

AATTGGACAG CAGCCATCAT CTCTTGCCIT TGTGGGGCA TCACTGTTGG CCTAACAGTC 480

CACCTCTGTA AGAAGAAGTT GCTGATCCAG AATGGCCCTG CAAATGTGTG CATCAGCTTC 540

AGCATCTGCC ATACCTTCCG GTGGCACGAA GCTATGTTCC TCCTGGAGIT CCTCCTGCC 600

CTGGGCATCA TCCTGTTCTG CTCAGCCAGA ATTATCTGGA GCCTGCGGCA GAGACAAATG 660
 GACCGGCATG CCAAGATCAA GAGAGCCAAA ACCTTCATCA TGGTGGTGGC CATCGTCTTTT 720
 GTCATCTGCT TCCTTCCCAG CGTGGTTGTG CGGATCCGCA TCTTCTGGCT CCTGCACACT 780
 TCGGGCACGC AGAATTGTGA AGTGACC GCCTGGGACC TGGCGTCTT TATCACTCTC 840
 5 AGCTTCACCT ACATGAACAG CATGCTGAC CCCGTGGTGT ACTACTTCTC CAGCCCATCC 900
 TTTCCCAACT TCTTCTCCAC TTTGATCAAC CGCTGCCTCC AGAGGAAGAT GACAGGTGAG 960
 CCAGATAATA ACCGCAGCAC GAGCGTCGAG CTCACAGGGG ACCCCAACAA AACAGAGGC 1020
 GCTCCAGAGG CGTAAATGSC CAACTCCGGT GAGCCATGGA GCCCCTCTTA TCTGGGCCCA 1080
 ACCTCAAATA ACCATTCCAA GAAGGGACAT TGTCACCAAG AACAGCATC TCTGGAGAAA 1140
 10 CAGTTGGGCT GTTGATCGA GTAA 1164

(223) INFORMATION FOR SEQ ID NO:222:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 387 amino acids

(B) TYPE: amino acid

(C) STRANDEDNESS:

(D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:222:

20 Met Asn Arg His His Leu Gln Asp His Phe Leu Glu Ile Asp Lys Lys
 1 5 10 15
 Asn Cys Cys Val Phe Arg Asp Asp Phe Ile Ala Lys Val Leu Pro Pro
 20 25 30
 Val Leu Gly Leu Glu Phe Ile Phe Gly Leu Leu Gly Asn Gly Leu Ala
 35 40 45
 25 Leu Trp Ile Phe Cys Phe His Leu Lys Ser Trp Lys Ser Ser Arg Ile
 50 55 60
 Phe Leu Phe Asn Leu Ala Val Ala Asp Phe Leu Leu Ile Ile Cys Leu
 65 70 75 80
 30 Pro Phe Val Met Asp Tyr Tyr Val Arg Arg Ser Asp Trp Lys Phe Gly
 85 90 95
 Asp Ile Pro Cys Arg Leu Val Leu Phe Met Phe Ala Met Asn Arg Gln
 100 105 110
 Gly Ser Ile Ile Phe Leu Thr Val Val Ala Val Asp Arg Tyr Phe Arg
 115 120 125

187

Val Val His Pro His His Ala Leu Asn Lys Ile Ser Asn Trp Thr Ala
130 135 140

Ala Ile Ile Ser Cys Leu Leu Trp Gly Ile Thr Val Gly Leu Thr Val
145 150 155 160

5 His Leu Leu Lys Lys Lys Leu Leu Ile Gln Asn Gly Pro Ala Asn Val
165 170 175

Cys Ile Ser Phe Ser Ile Cys His Thr Phe Arg Trp His Glu Ala Met
180 185 190

10 Phe Leu Leu Glu Phe Leu Leu Pro Leu Gly Ile Ile Leu Phe Cys Ser
195 200 205

Ala Arg Ile Ile Trp Ser Leu Arg Gln Arg Gln Met Asp Arg His Ala
210 215 220

Lys Ile Lys Arg Ala Lys Thr Phe Ile Met Val Val Ala Ile Val Phe
225 230 235 240

15 Val Ile Cys Phe Leu Pro Ser Val Val Val Arg Ile Arg Ile Phe Trp
245 250 255

Leu Leu His Thr Ser Gly Thr Gln Asn Cys Glu Val Tyr Arg Ser Val
260 265 270

20 Asp Leu Ala Phe Phe Ile Thr Leu Ser Phe Thr Tyr Met Asn Ser Met
275 280 285

Leu Asp Pro Val Val Tyr Tyr Phe Ser Ser Pro Ser Phe Pro Asn Phe
290 295 300

Phe Ser Thr Leu Ile Asn Arg Cys Leu Gln Arg Lys Met Thr Gly Glu
305 310 315 320

25 Pro Asp Asn Asn Arg Ser Thr Ser Val Glu Leu Thr Gly Asp Pro Asn
325 330 335

Lys Thr Arg Gly Ala Pro Glu Ala Leu Met Ala Asn Ser Gly Glu Pro
340 345 350

30 Trp Ser Pro Ser Tyr Leu Gly Pro Thr Ser Asn Asn His Ser Lys Lys
355 360 365

Gly His Cys His Gln Glu Pro Ala Ser Leu Glu Lys Gln Leu Gly Cys
370 375 380

Cys Ile Glu
385

35 (224) INFORMATION FOR SEQ ID NO:223:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 1212 base pairs

188

(B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: DNA (genomic)

5 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:223:

ATGGCTTGCA	ATGGCAGTGC	GGCCAGGGGG	CACCTTGACC	CTGAGGACTT	GAACCTGACT	60
GACGAGGCAC	TGAGACTCAA	GTACCTGGGG	CCCCAGCAGA	CAGAGCTGTT	CATGCCCATC	120
TGTGCCACAT	ACCTGCTGAT	CTTCGTGGTG	GGCGCTGTGG	GCAATGGGCT	GACCTGTCTG	180
GTCATCCTGC	GCCACAAGGC	CATGCGCACG	CCTACCAACT	ACTACCTCTT	CAGCCTGGCC	240
10 GTGTCGACC	TGCTGTGCT	GCTGGTGGG	CTGCCCCG	AGCTCTATGA	GATGTGGCAC	300
AACTACCCCT	TCCTGCTGG	CGTTGGTGG	TGCTATTTC	GCAGCTACT	GTTTGAGATG	360
GTCTGCCTGG	CCTCAGTGCT	CAACGTCACT	GCCCTGAGCG	TGGAACGCTA	TGTGGCCGTG	420
GTGCACCAC	TCCAGGCCAG	GTCCATGGTG	ACGCGGGCCC	ATGTGCGCCG	AGTGCTTGGG	480
GCCGCTGGG	GTCTTGCCAT	GCTCTGCTCC	CTGCCAACA	CCAGCCTGCA	CGGCATCCGG	540
15 CAGCTGCACG	TGCCCTGCCG	GGGCCAGTG	CCAGACTCAG	CTGTTTGAT	GCTGGTCCGC	600
CCACGGGCC	TCTACAACAT	GGTAGTGCAG	ACCACCGCG	TGCTCTTCTT	CTGCCTGCC	660
ATGGCCATCA	TGAGCGTGCT	CTACCTGCTC	ATTGGGCTGC	GACTGCGGCG	GGAGAGGCTG	720
CTGCTCATGC	AGGAGGCCAA	GGGCGGGG	TCTGCAGCAG	CCAGGTCAG	ATACACCTGC	780
AGGCTCCAGC	AGCACGATCG	GGGCCGAGA	CAAGTGAAGA	AGATGCTGTT	TGCTCTGGTC	840
20 GTGGTGTGTT	GCATCTGCTG	GGCCCGGTT	CACGCCGACC	GGCTCATGTG	GAGCGTCGTG	900
TCACAGTGGA	CAGATGGCCT	GCACCTGGCC	TTCCAGCACG	TGCACGTCAT	CTCCGGCATC	960
TTCTTCTACC	TGGGCTCGGC	GGCCAACCC	GTGCTCTATA	GCCTCATGTC	CAGCCGCTTC	1020
CGAGAGACCT	TCCAGGAGGC	CCTGTGCCTC	GGGGCCTGCT	GCCATGCGCT	CAGACCCGCG	1080
CACAGCTCCC	ACAGCCTCAG	CAGGATGACC	ACAGGCAGCA	CCCTGTGTGA	TGTGGGCTCC	1140
25 CTGGGCAGCT	GGGTCCACCC	CCTGGCTGGG	AACGATGGCC	CAGAGGCGCA	GCAAGAGACC	1200
GATCCATCCT	GA					1212

(225) INFORMATION FOR SEQ ID NO:224:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 403 amino acids
 (B) TYPE: amino acid

30

(C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:224:

```

5  Met Ala Cys Asn Gly Ser Ala Ala Arg Gly His Phe Asp Pro Glu Asp
   1          5          10          15

   Leu Asn Leu Thr Asp Glu Ala Leu Arg Leu Lys Tyr Leu Gly Pro Gln
           20          25          30

10  Gln Thr Glu Leu Phe Met Pro Ile Cys Ala Thr Tyr Leu Leu Ile Phe
    35          40          45

   Val Val Gly Ala Val Gly Asn Gly Leu Thr Cys Leu Val Ile Leu Arg
   50          55          60

   His Lys Ala Met Arg Thr Pro Thr Asn Tyr Tyr Leu Phe Ser Leu Ala
   65          70          75          80

15  Val Ser Asp Leu Leu Val Leu Leu Val Gly Leu Pro Leu Glu Leu Tyr
    85          90          95

   Glu Met Trp His Asn Tyr Pro Phe Leu Leu Gly Val Gly Gly Cys Tyr
   100          105          110

20  Phe Arg Thr Leu Leu Phe Glu Met Val Cys Leu Ala Ser Val Leu Asn
    115          120          125

   Val Thr Ala Leu Ser Val Glu Arg Tyr Val Ala Val Val His Pro Leu
   130          135          140

   Gln Ala Arg Ser Met Val Thr Arg Ala His Val Arg Arg Val Leu Gly
   145          150          155          160

25  Ala Val Trp Gly Leu Ala Met Leu Cys Ser Leu Pro Asn Thr Ser Leu
    165          170          175

   His Gly Ile Arg Gln Leu His Val Pro Cys Arg Gly Pro Val Pro Asp
    180          185          190

   Ser Ala Val Cys Met Leu Val Arg Pro Arg Ala Leu Tyr Asn Met Val
   195          200          205

30  Val Gln Thr Thr Ala Leu Leu Phe Phe Cys Leu Pro Met Ala Ile Met
    210          215          220

   Ser Val Leu Tyr Leu Leu Ile Gly Leu Arg Leu Arg Arg Glu Arg Leu
   225          230          235          240

35  Leu Leu Met Gln Glu Ala Lys Gly Arg Gly Ser Ala Ala Ala Arg Ser
    245          250          255

```

190

Arg Tyr Thr Cys Arg Leu Gln Gln His Asp Arg Gly Arg Arg Gln Val
 260 265 270

Lys Lys Met Leu Phe Val Leu Val Val Val Phe Gly Ile Cys Trp Ala
 275 280 285

5 Pro Phe His Ala Asp Arg Val Met Trp Ser Val Val Ser Gln Trp Thr
 290 295 300

Asp Gly Leu His Leu Ala Phe Gln His Val His Val Ile Ser Gly Ile
 305 310 315 320

10 Phe Phe Tyr Leu Gly Ser Ala Ala Asn Pro Val Leu Tyr Ser Leu Met
 325 330 335

Ser Ser Arg Phe Arg Glu Thr Phe Gln Glu Ala Leu Cys Leu Gly Ala
 340 345 350

Cys Cys His Arg Leu Arg Pro Arg His Ser Ser His Ser Leu Ser Arg
 355 360 365

15 Met Thr Thr Gly Ser Thr Leu Cys Asp Val Gly Ser Leu Gly Ser Trp
 370 375 380

Val His Pro Leu Ala Gly Asn Asp Gly Pro Glu Ala Gln Gln Glu Thr
 385 390 395 400

20 Asp Pro Ser

(226) INFORMATION FOR SEQ ID NO:225:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 1098 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:225:

ATGGGGAACA TCATGCGAGA CAACTCCTCG ATGAGCTGTA CCATCGACCA TACCATCCAC 60

30 CAGACGCTGG CCCCAGTGGT CTATGTTACC GTGCTGGTGG TGGGCTTCCC GGCCAACTGC 120

CTGTCCTCT ACTTCGGCTA CCTGCAGATC AAGGCCCGGA ACGAGCTGGG CGTGTACCTG 180

TGCAACCTGA CGGTGGCCGA CCTCTTCTAC ATCTGCTCGC TGCCCTTCTG GCTGCAGTAC 240

GTGCTGCAGC ACGACAACCT GTCTCAGGCG GACCTGTCTT GCCAGGTGTG CGGCATCCTC 300

CTGTACGAGA ACATCTACAT CAGCGTGGGC TTCCTCTGCT GCATCTCCGT GGACCGCTAC 360

35 CTGGCTGTGG CCCATCCCTT CCGCTTCCAC CAGTTCGGGA CCCTGAAGGC GGCCGTGGCG 420

191

GTCAGCGTGG TCATCTGGGC CAAGGAGCTG CTGACCAGCA TCTACTTCTT GATGCACGAG 480
 GAGGTGATCG AGGACGAGAA CCAGCACCGC GTGTGCTTTG AGCACTACCC CATCCAGGCA 540
 TGGCAGCGCG CCATCAACTA CTACCGCTTC CTGGTGGGCT TCCTCTTCCC CATCTGCCTG 600
 CTGTGGCGT CCTACCAGGG CATCTCGCG GCCGTGCGCC GGAGGCCACGG CACCCAGAAG 660
 5 AGCCGCAAGG ACCAGATCAA GCGGCTGGTG CTCAGCACCG TGGTCATCTT CTTGGCCTGC 720
 TTCTGCCCT ACCACGTGTT GCTGCTGGTG CGCAGCGTCT GGGAGGCCAG CTGCGACTTC 780
 GCCAAGGGCG TTTTCAACGC CTACCACTTC TCCCTCCTGC TCACCAGCTT CAACTGCGTC 840
 GCCGACCCCG TGCTCTACTG CTTGCTCAGC GAGACCACCC ACCGGGACCT GGCCCGCCTC 900
 CGCGGGGCCCT GCCTGGCCTT CCTCACCTGC TCCAGGACCG GCCGGGCCAG GGAGGCCTAC 960
 10 CCGCTGGGTG CCCCCGAGCG CTCCGGGAAA AGCGGGGCCG AGGGTGAGGA GCCCGAGCTG 1020
 TTGACCAAGC TCCACCCGGC CTTCCAGACC CCTAACTCGC CAGGGTCGGG CGGGTTCCCC 1080
 ACGGCGAGGT TGGCCTAG 1098

(227) INFORMATION FOR SEQ ID NO:226:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 365 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:226:

Met Gly Asn Ile Thr Ala Asp Asn Ser Ser Met Ser Cys Thr Ile Asp
 1 5 10 15
 His Thr Ile His Gln Thr Leu Ala Pro Val Val Tyr Val Thr Val Leu
 20 25 30
 25 Val Val Gly Phe Pro Ala Asn Cys Leu Ser Leu Tyr Phe Gly Tyr Leu
 35 40 45
 Gln Ile Lys Ala Arg Asn Glu Leu Gly Val Tyr Leu Cys Asn Leu Thr
 50 55 60
 30 Val Ala Asp Leu Phe Tyr Ile Cys Ser Leu Pro Phe Trp Leu Gln Tyr
 65 70 75 80
 Val Leu Gln His Asp Asn Trp Ser His Gly Asp Leu Ser Cys Gln Val
 85 90 95
 Cys Gly Ile Leu Leu Tyr Glu Asn Ile Tyr Ile Ser Val Gly Phe Leu

192

	100	105	110
	Cys Cys Ile Ser Val Asp Arg Tyr	Leu Ala Val Ala His Pro Phe Arg	
	115	120	125
5	Phe His Gln Phe Arg Thr Leu Lys	Ala Ala Val Gly Val Ser Val Val	
	130	135	140
	Ile Trp Ala Lys Glu Leu Leu Thr Ser Ile Tyr	Phe Leu Met His Glu	
	145	150	155
	Glu Val Ile Glu Asp Glu Asn Gln His Arg Val Cys Phe	Glu His Tyr	
	165	170	175
10	Pro Ile Gln Ala Trp Gln Arg Ala Ile Asn Tyr Tyr Arg	Phe Leu Val	
	180	185	190
	Gly Phe Leu Phe Pro Ile Cys Leu Leu Leu Ala Ser Tyr	Gln Gly Ile	
	195	200	205
15	Leu Arg Ala Val Arg Arg Ser His Gly Thr Gln Lys Ser Arg Lys Asp		
	210	215	220
	Gln Ile Lys Arg Leu Val Leu Ser Thr Val Val Ile Phe Leu Ala Cys		
	225	230	235
	Phe Leu Pro Tyr His Val Leu Leu Leu Val Arg Ser Val Trp Glu Ala		
	245	250	255
20	Ser Cys Asp Phe Ala Lys Gly Val Phe Asn Ala Tyr His Phe Ser Leu		
	260	265	270
	Leu Leu Thr Ser Phe Asn Cys Val Ala Asp Pro Val Leu Tyr Cys Phe		
	275	280	285
25	Val Ser Glu Thr Thr His Arg Asp Leu Ala Arg Leu Arg Gly Ala Cys		
	290	295	300
	Leu Ala Phe Leu Thr Cys Ser Arg Thr Gly Arg Ala Arg Glu Ala Tyr		
	305	310	315
	Pro Leu Gly Ala Pro Glu Ala Ser Gly Lys Ser Gly Ala Gln Gly Glu		
	325	330	335
30	Glu Pro Glu Leu Leu Thr Lys Leu His Pro Ala Phe Gln Thr Pro Asn		
	340	345	350
	Ser Pro Gly Ser Gly Gly Phe Pro Thr Gly Arg Leu Ala		
	355	360	365

(228) INFORMATION FOR SEQ ID NO:227:

35

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 1416 base pairs
 (B) TYPE: nucleic acid

(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:227:

5	ATGGATATTC TTTGTGAAGA AAATACTTCT TTGAGCTCAA CTACGAACTC CCTAATGCAA	60
	TTAARTGATG ACAACAGGCT CTACAGTAAT GACTTTAACT CGGAGAAGC TAACACTTCT	120
	GATGCATTTA ACTGGACAGT CGACTCTGAA AATCGAACCA ACCTTTCCCTG TGAAGGGTGC	180
	CTCTCACCGT CGTGCTCTCT CTTACTTCAT CTCCAGGAAA AAAACTGGTC TGCTTTACTG	240
	ACAGCCGTAG TGATTATTCT AACTATTGCT GGAAACATAC TCGTCATCAT GGCAGTGTCC	300
10	CTAGAGAAAA AGCTGCAGAA TGCCACCAAC TATTTCCCTGA TGTCACTTGC CATAGCTGAT	360
	ATGTCTCTGG GTTTCCTTGT CATGCCCGTG TCCATGTTAA CCATCCTGTA TGGGTACCGG	420
	TGGCCTCTGC CGAGCAAGCT TTGTGCAGTC TGGATTTACC TGGACGTGCT CTTCCTCCACG	480
	GCCTCCATCA TGCACCTCTG CGCCATCTCG CTGGACCGCT ACGTCGCCAT CCAGAAATCCC	540
	ATCCACCACA GCGCTTCAA CTCCAGAACT AAGGCAITTC TGAAAAATCAT TGCTGTTTGG	600
15	ACCATATCAG TAGGTATATC CATGCCAATA CCAGTCTTTG GGCTACAGGA CGATTGGAAG	660
	GTCTTTAAGG AGGGGAGTTG CTTACTCGCC GATGATAACT TTGTCCTGAT CGGCTCTTTT	720
	GTGTCATTTT TCATTCCCTT AACCATCATG GTGATCACCT ACTTTCTAAC TATCAAGTCA	780
	CTCCAGAAAG AAGCTACTTT GTGTGTAAGT GATCTTGGCA CACGGGCCAA ATTAGCTTCT	840
	TTCAGCTTCC TCCCTCAGAG TTCTTTGTCT TCAGAAAAGC TCTTCCAGCG GTCGATCCAT	900
20	AGGGAGCCAG GGTCTCTAC AGGCAGGAGG ACTATGCAGT CCATCAGCAA TGAGCAAAAG	960
	GCAAAGAAGG TGCTGGGCAT CGTCTTCTTC CTGTTTGTGG TGATGTGGTG CCCTTTCTTC	1020
	ATCACAACA TCATGGCCGT CATCTGCAAA GAGTCCTGCA ATGAGGATGT CATTGGGGCC	1080
	CTGCTCAATG TGTTTGTTTG GATCGGTTAT CTCTCTTCAG CAGTCAACCC ACTAGTCTAC	1140
	ACACTGTTCA ACAAGACCTA TAGGTCAGCC TTTTCACGGT ATATTGAGT TCAGTACAAG	1200
25	GAAAAACAAA AACCATTGCA GTTAATTTTA GTGAACACAA TACCGGCTTT GGCCTACAAG	1260
	TCTAGCCAAC TTCAAATGGG ACAAATAAAG AATTCAAAGC AAGATGCCAA GACAACAGAT	1320
	AATGACTGCT CAATGGTTGC TCTAGGAAAG CAGTATTCTG AAGAGGCTTC TAAAGACAAT	1380
	AGCGACGGAG TGAATGAAAA GGTGAGCTGT GTGTGA	1416

(229) INFORMATION FOR SEQ ID NO:228:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 470 amino acids

(B) TYPE: amino acid

(C) STRANDEDNESS:

(D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:228:

```

Met Asp Ile Leu Cys Glu Glu Asn Thr Ser Leu Ser Ser Thr Thr Asn
      5              10              15
Ser Leu Met Gln Leu Asn Asp Asp Asn Arg Leu Tyr Ser Asn Asp Phe
      20              25              30

Asn Ser Gly Glu Ala Asn Thr Ser Asp Ala Phe Asn Trp Thr Val Asp
      35              40              45

Ser Glu Asn Arg Thr Asn Leu Ser Cys Glu Gly Cys Leu Ser Pro Ser
      50              55              60

Cys Leu Ser Leu Leu His Leu Gln Glu Lys Asn Trp Ser Ala Leu Leu
      65              70              75

Thr Ala Val Val Ile Ile Leu Thr Ile Ala Gly Asn Ile Leu Val Ile
      85              90              95

Met Ala Val Ser Leu Glu Lys Lys Leu Gln Asn Ala Thr Asn Tyr Phe
      100             105             110

Leu Met Ser Leu Ala Ile Ala Asp Met Leu Leu Gly Phe Leu Val Met
      115             120             125

Pro Val Ser Met Leu Thr Ile Leu Tyr Gly Tyr Arg Trp Pro Leu Pro
      130             135             140

Ser Lys Leu Cys Ala Val Trp Ile Tyr Leu Asp Val Leu Phe Ser Thr
      145             150             155             160

Ala Ser Ile Met His Leu Cys Ala Ile Ser Leu Asp Arg Tyr Val Ala
      165             170             175

Ile Gln Asn Pro Ile His His Ser Arg Phe Asn Ser Arg Thr Lys Ala
      180             185             190

Phe Leu Lys Ile Ile Ala Val Trp Thr Ile Ser Val Gly Ile Ser Met
      195             200             205

Pro Ile Pro Val Phe Gly Leu Gln Asp Asp Ser Lys Val Phe Lys Glu
      210             215             220

Gly Ser Cys Leu Leu Ala Asp Asp Asn Phe Val Leu Ile Gly Ser Phe
      225             230             235             240

```

195

Val Ser Phe Phe Ile Pro Leu Thr Ile Met Val Ile Thr Tyr Phe Leu
245 250 255

Thr Ile Lys Ser Leu Gln Lys Glu Ala Thr Leu Cys Val Ser Asp Leu
260 265 270

5 Gly Thr Arg Ala Lys Leu Ala Ser Phe Ser Phe Leu Pro Gln Ser Ser
275 280 285

Leu Ser Ser Glu Lys Leu Phe Gln Arg Ser Ile His Arg Glu Pro Gly
290 295 300

10 Ser Tyr Thr Gly Arg Arg Thr Met Gln Ser Ile Ser Asn Glu Gln Lys
305 310 315 320

Ala Lys Lys Val Leu Gly Ile Val Phe Phe Leu Phe Val Val Met Trp
325 330 335

Cys Pro Phe Phe Ile Thr Asn Ile Met Ala Val Ile Cys Lys Glu Ser
340 345 350

15 Cys Asn Glu Asp Val Ile Gly Ala Leu Leu Asn Val Phe Val Trp Ile
355 360 365

Gly Tyr Leu Ser Ser Ala Val Asn Pro Leu Val Tyr Thr Leu Phe Asn
370 375 380

20 Lys Thr Tyr Arg Ser Ala Phe Ser Arg Tyr Ile Gln Cys Gln Tyr Lys
385 390 395 400

Glu Asn Lys Lys Pro Leu Gln Leu Ile Leu Val Asn Thr Ile Pro Ala
405 410 415

Leu Ala Tyr Lys Ser Ser Gln Leu Gln Met Gly Gln Lys Lys Asn Ser
420 425 430

25 Lys Gln Asp Ala Lys Thr Thr Asp Asn Asp Cys Ser Met Val Ala Leu
435 440 445

Gly Lys Gln Tyr Ser Glu Glu Ala Ser Lys Asp Asn Ser Asp Gly Val
450 455 460

30 Asn Glu Lys Val Ser Cys Val
465 470

(230) INFORMATION FOR SEQ ID NO:229:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 1377 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear
- 35
- (ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:229:

	ATGGTGAACC	TGAGGAATGC	GGTGCATTCA	TTCTTGTGTC	ACCTAATTGG	CCTATTGGTT	60
	TGGCAATGTG	ATATTCTGT	GAGCCCAGTA	GCAGCTATAG	TAAC TGACAT	TTTCAATACC	120
	TCCGATGGTG	GACGCTTCAA	ATTCCCAGAC	GGGGTACAAA	ACTGGCCAGC	ACTTTCAATC	180
5	GTACATCAAA	TAATCATGAC	AATAGGTGGC	AACATCCTTG	TGATCATGGC	AGTAAGCATG	240
	GAAAAGAAAC	TGCACAATGC	CACCAATTAC	TTCTTAATGT	CCCTAGCCAT	TGCTGATATG	300
	CTAGTGGGAC	TACTTGTGAT	GCCCTGTCT	CTCTGGCAA	TCCTTTATGA	TTATGTCTGG	360
	CCACTACCTA	GATATTGTG	CCCGTCTGG	ATTTCTTTAG	ATGTTTTATT	TTCAACAGCG	420
	TCCATCATGC	ACCTCTGCGC	TATATCGCTG	GATCGGTATG	TAGCAATACG	TAATCCTATT	480
10	GAGCATAGCC	GTTTCAATTC	GCGGACTAAG	GCCATCATGA	AGATTGCTAT	TGTTTGGGCA	540
	ATTTCTATAG	GTGTATCAGT	TCCTATCCCT	GTGATTGGAC	TGAGGGACGA	AGAAAAGGTG	600
	TTCTGTAAAC	ACACGACGTG	CGTGCTCAAC	GACCCAAAAT	TCGTTCTTAT	TGGGTCCTTC	660
	GTAGCTTTCT	TCATACCGCT	GACGATTATG	GTGATTACGT	ATTGCGCTGAC	CATCTACGTT	720
	CTGCGCCGAC	AAGCTTTGAT	GTTACTGCAC	GGCCACACCG	AGGAACCGCC	TGGACTAAGT	780
15	CTGGATTTC	TGAAGTGCTG	CAAGAGGAAT	ACGCGCGAGG	AAGAGAAGCT	TGCAAACCCCT	840
	AACCAAGACC	AGAAGCAGC	CGAAGAAAG	AAGAAGGAGA	GACGTCCTAG	GGGCACCATG	900
	CAGGCTATCA	ACAATGAAAG	AAAAGCTAAG	AAAGTCCTTG	GGATTGTTTT	CTTTGTGTTT	960
	CTGATCATGT	GGTGCCCAT	TTTCATTACC	AATATTCTGT	CTGTTCTTGG	TGAGAAGTCC	1020
	TGTAACCAAA	AGCTCATGGA	AAAGCTTCTG	AATGTGTTTG	TTTGGATTGG	CTATGTTTGT	1080
20	TCAGGAATCA	ATCCTCTGGT	GTATACTCTG	TTCAACAAAA	TTTACCGAAG	GGCATTCTCC	1140
	AACTATTGTC	GTTGCAATTA	TAAGGTAGAG	AAAAAGCCTC	CTGTAGGCA	GATTCCAAGA	1200
	GTTGCCGCCA	CTGCTTTGTC	TGGGAGGGAG	CTTAATGTTA	ACATTATATCG	GCATACCAAT	1260
	GAACCGGTGA	TCGAGAAAGC	CAGTGACAAAT	GAGCCCGGTA	TAGAGATGCA	AGTTGAGAAT	1320
	TTAGAGTTAC	CAGTAAATCC	CTCCAGTGTG	GTTAGCGAAA	GGATTAGCAG	TGTGTGA	1377

25 (231) INFORMATION FOR SEQ ID NO:230:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 458 amino acids

(B) TYPE: amino acid

(C) STRANDEDNESS:

(D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:230:

5 Met Val Asn Leu Arg Asn Ala Val His Ser Phe Leu Val His Leu Ile
 1 5 10 15
 Gly Leu Leu Val Trp Gln Cys Asp Ile Ser Val Ser Pro Val Ala Ala
 20 25 30
 Ile Val Thr Asp Ile Phe Asn Thr Ser Asp Gly Gly Arg Phe Lys Phe
 35 40 45
 10 Pro Asp Gly Val Gln Asn Trp Pro Ala Leu Ser Ile Val Ile Ile Ile
 50 55 60
 Ile Met Thr Ile Gly Gly Asn Ile Leu Val Ile Met Ala Val Ser Met
 65 70 75 80
 15 Glu Lys Lys Leu His Asn Ala Thr Asn Tyr Phe Leu Met Ser Leu Ala
 85 90 95
 Ile Ala Asp Met Leu Val Gly Leu Leu Val Met Pro Leu Ser Leu Leu
 100 105 110
 Ala Ile Leu Tyr Asp Tyr Val Trp Pro Leu Pro Arg Tyr Leu Cys Pro
 115 120 125
 20 Val Trp Ile Ser Leu Asp Val Leu Phe Ser Thr Ala Ser Ile Met His
 130 135 140
 Leu Cys Ala Ile Ser Leu Asp Arg Tyr Val Ala Ile Arg Asn Pro Ile
 145 150 155 160
 25 Glu His Ser Arg Phe Asn Ser Arg Thr Lys Ala Ile Met Lys Ile Ala
 165 170 175
 Ile Val Trp Ala Ile Ser Ile Gly Val Ser Val Pro Ile Pro Val Ile
 180 185 190
 Gly Leu Arg Asp Glu Glu Lys Val Phe Val Asn Asn Thr Thr Cys Val
 195 200 205
 30 Leu Asn Asp Pro Asn Phe Val Leu Ile Gly Ser Phe Val Ala Phe Phe
 210 215 220
 Ile Pro Leu Thr Ile Met Val Ile Thr Tyr Cys Leu Thr Ile Tyr Val
 225 230 235 240
 35 Leu Arg Arg Gln Ala Leu Met Leu Leu His Gly His Thr Glu Glu Pro
 245 250 255
 Pro Gly Leu Ser Leu Asp Phe Leu Lys Cys Cys Lys Arg Asn Thr Ala

198

	260	265	270
	Glu Glu Glu Asn Ser Ala Asn Pro Asn Gln Asp Gln Asn Ala Arg Arg		
	275	280	285
5	Arg Lys Lys Lys Glu Arg Arg Pro Arg Gly Thr Met Gln Ala Ile Asn		
	290	295	300
	Asn Glu Arg Lys Ala Lys Lys Val Leu Gly Ile Val Phe Phe Val Phe		
	305	310	315 320
	Leu Ile Met Trp Cys Pro Phe Phe Ile Thr Asn Ile Leu Ser Val Leu		
	325	330	335
10	Cys Glu Lys Ser Cys Asn Gln Lys Leu Met Glu Lys Leu Leu Asn Val		
	340	345	350
	Phe Val Trp Ile Gly Tyr Val Cys Ser Gly Ile Asn Pro Leu Val Tyr		
	355	360	365
15	Thr Leu Phe Asn Lys Ile Tyr Arg Arg Ala Phe Ser Asn Tyr Leu Arg		
	370	375	380
	Cys Asn Tyr Lys Val Glu Lys Lys Pro Pro Val Arg Gln Ile Pro Arg		
	385	390	395 400
	Val Ala Ala Thr Ala Leu Ser Gly Arg Glu Leu Asn Val Asn Ile Tyr		
	405	410	415
20	Arg His Thr Asn Glu Pro Val Ile Glu Lys Ala Ser Asp Asn Glu Pro		
	420	425	430
	Gly Ile Glu Met Gln Val Glu Asn Leu Glu Leu Pro Val Asn Pro Ser		
	435	440	445
25	Ser Val Val Ser Glu Arg Ile Ser Ser Val		
	450	455	

(232) INFORMATION FOR SEQ ID NO:231:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 1068 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:231:

ATGGATCAGT TCCCTGAATC AGTGACAGAA AACTTTGAGT ACGATGATTT GGCTGAGGCC	60
35 TGTTATATTG GGGACATCGT GGTCTTTGGG ACTGTGTCC TGTCCATATT CTACTCCGTC	120
ATCTTTGCCA TTGGCCTGGT GGGAAATTG TTGGTAGTGT TTGCCCTCAC CAACAGCAAG	180

199

AAGCCCAAGA GTGTCACCGA CATTACCTC CTGAACCTGG CCTGTCTGA TCTGCTGTTT 240
 GTAGCCACTT TGCCCTTCTG GACTCACTAT TTGATAAATG AAAAGGGCCT CCACAATGCC 300
 ATGTGCAAAAT TCACTACCGC CTTCTTCTTC ATCGGCTTTT TTGGAAGCAT ATTCTTCATC 360
 ACCGTCATCA GCATTGATAG GTACCTGGCC ATCGTCTGG CCGCCAACCT CATGAACAAC 420
 5 CGGACCGTGC AGCATGGCGT CACCATCAGC CTAGGCGTCT GGGCAGCAGC CATTTTGGTG 480
 GCAGCACCCC AGTTTCATGT CACAAAGCAG AAAGAAAATG AATGCCTTGG TGACTACCCC 540
 GAGGTCCTCC AGGAAATCTG GCCCGTGCTC CGCAATGTGG AAACAAATTT TCTTGGCTTC 600
 CTACTCCCCC TGCTCATTAT GAGTTATTGC TACTTCAGAA TCATCCAGAC GCTGTTTTTC 660
 TGCAAGAAC ACAAGAAAGC CAAAGCCAAG AAATCATTAT TTCTGGTGGT CATCGTGTTT 720
 10 TTCTCTTCTT GGACACCTTA CAACGTTATG ATTTTCCTGG AGACGCTAA GCTCTATGAC 780
 TTCTTTCCCA GTTGTGACAT GAGGAAGGAT CTGAGGCTGG CCCTCAGTGT GACTGAGACG 840
 GTTGCAATTA GCCATTGTTG CCTGAATCCT CTCATCTATG CATTGTCTGG GGAGAAGTTC 900
 AGAAGATACC TTTACCACCT GTATGGGAAA TGCCTGCTG TCCTGTGTGG GCGCTCAGTC 960
 CACGTTGATT TCTCCTCATC TGARTCACAA AGGAGCAGGC ATGGAAGTGT TCTGAGCAGC 1020
 15 AATTTTACTT ACCACACGAG TGATGGAGAT GCATTGCTCC TTCTCTGA 1068

(233) INFORMATION FOR SEQ ID NO:232:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 355 amino acids
 (B) TYPE: amino acid
 20 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

 (ii) MOLECULE TYPE: protein

 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:232:

25 Met Asp Gln Phe Pro Glu Ser Val Thr Glu Asn Phe Glu Tyr Asp Asp
 1 5 10 15

 Leu Ala Glu Ala Cys Tyr Ile Gly Asp Ile Val Val Phe Gly Thr Val
 20 25 30

 Phe Leu Ser Ile Phe Tyr Ser Val Ile Phe Ala Ile Gly Leu Val Gly
 35 40 45

 30 Asn Leu Leu Val Val Phe Ala Leu Thr Asn Ser Lys Lys Pro Lys Ser
 50 55 60

 Val Thr Asp Ile Tyr Leu Leu Asn Leu Ala Leu Ser Asp Leu Leu Phe

200

	65		70		75		80
	Val Ala Thr Leu Pro	Phe Trp Thr His Tyr Leu Ile Asn Glu Lys Gly					
		85		90		95	
5	Leu His Asn Ala Met Cys Lys Phe Thr Thr Ala Phe Phe Phe Ile Gly						
		100	105		110		
	Phe Phe Gly Ser Ile Phe Phe Ile Thr Val Ile Ser Ile Asp Arg Tyr						
		115	120		125		
	Leu Ala Ile Val Leu Ala Ala Asn Ser Met Asn Asn Arg Thr Val Gln						
		130	135		140		
10	His Gly Val Thr Ile Ser Leu Gly Val Trp Ala Ala Ile Leu Val						
		145	150		155		160
	Ala Ala Pro Gln Phe Met Phe Thr Lys Gln Lys Glu Asn Glu Cys Leu						
		165		170		175	
15	Gly Asp Tyr Pro Glu Val Leu Gln Glu Ile Trp Pro Val Leu Arg Asn						
		180		185		190	
	Val Glu Thr Asn Phe Leu Gly Phe Leu Leu Pro Leu Leu Ile Met Ser						
		195	200		205		
	Tyr Cys Tyr Phe Arg Ile Ile Gln Thr Leu Phe Ser Cys Lys Asn His						
		210	215		220		
20	Lys Lys Ala Lys Ala Lys Lys Leu Ile Leu Leu Val Val Ile Val Phe						
		225	230		235		240
	Phe Leu Phe Trp Thr Pro Tyr Asn Val Met Ile Phe Leu Glu Thr Leu						
		245		250		255	
25	Lys Leu Tyr Asp Phe Phe Pro Ser Cys Asp Met Arg Lys Asp Leu Arg						
		260	265		270		
	Leu Ala Leu Ser Val Thr Glu Thr Val Ala Phe Ser His Cys Cys Leu						
		275	280		285		
	Asn Pro Leu Ile Tyr Ala Phe Ala Gly Glu Lys Phe Arg Arg Tyr Leu						
		290	295		300		
30	Tyr His Leu Tyr Gly Lys Cys Leu Ala Val Leu Cys Gly Arg Ser Val						
		305	310		315		320
	His Val Asp Phe Ser Ser Ser Glu Ser Gln Arg Ser Arg His Gly Ser						
		325		330		335	
35	Val Leu Ser Ser Asn Phe Thr Tyr His Thr Ser Asp Gly Asp Ala Leu						
		340	345		350		
	Leu Leu Leu						
		355					

(234) INFORMATION FOR SEQ ID NO:233:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 29 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(iv) ANTI-SENSE: NO

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:233:

10 GGCTTAAGAG CATCATCGTG GTGCTGGTG

29

(235) INFORMATION FOR SEQ ID NO:234:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 34 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(iv) ANTI-SENSE: YES

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:234:

20 GTCACCACCA GCACCACGAT GATGCTCTTA AGCC

34

(236) INFORMATION FOR SEQ ID NO:235:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 31 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:235:

CAAAGAAAGT ACTGGGCATC GTCTTCTTCC T

31

30 (237) INFORMATION FOR SEQ ID NO:236:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 30 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

202

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:236:

TGCTCTAGAT TCCAGATAGG TGAAACTTG

30

(238) INFORMATION FOR SEQ ID NO:237:

- 5 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 50 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

- 10 (iv) ANTI-SENSE: NO

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:237:

CTAGGGGCAC CATGCAGGCT ATCAACAATG AAAGAAAAGC TAAGAAAATC

50

(239) INFORMATION FOR SEQ ID NO:238:

- 15 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 50 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

- 20 (iv) ANTI-SENSE: YES

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:238:

CAAGGACTTT CTTAGCTTTT CTTTCATTGT TGATAGCCTG CATGGTGCCC

50

(240) INFORMATION FOR SEQ ID NO:239:

- 25 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 35 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

- 30 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:239:

CGGCGGCAGA AGCGGAAACG CATGATCCTC GCGGT

35

(241) INFORMATION FOR SEQ ID NO:240:

- 35 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 35 base pairs
(B) TYPE: nucleic acid

203

- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:240:

5 ACCGCGAGGA TCATGCGTTT CGCCTTCTGC CGCCG 35

(242) INFORMATION FOR SEQ ID NO:241:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 24 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:241:

GAGACATATT ATCTGCCACG GAGG 24

15 (243) INFORMATION FOR SEQ ID NO:242:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 24 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:242:

TTGGCATAGA AACCGGACCC AAGG 24

(244) INFORMATION FOR SEQ ID NO:243:

25 (i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 28 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

30 (ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:243:

TAAGAATTCC ATAAAAATTA TGGAATGG 28

(245) INFORMATION FOR SEQ ID NO:244:

(i) SEQUENCE CHARACTERISTICS:

204

- (A) LENGTH: 30 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

5 (ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:244:

CCAGGATCCA GCTGAAGTCT TCCATCATTC 30

(246) INFORMATION FOR SEQ ID NO:245:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 1071 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

15 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:245:

ATGAATGGGG TCTCGAGGG GACCAGAGGC TGCAAGTACA GGCAACCTGG GGTCTGACA 60

CGTGATCGCT CTGTGCCAG GAAGATGAAC TCTTCCGGAT GCCTGTCTGA GGAGGTGGGG 120

TCCCTCCGCC CACTGACTGT GGTATCTCTG TCTGCGTCCA TTGTGCTCGG AGTGCTGGGC 180

AATGGGCTGG TGCTGTGGAT GACTGTCTTC CGTATGGCAC GCACGGTCTC CACCGTCTGC 240

20 TTCTTCACAC TGGCCCTTGC CGATTTCATG CTCTCACTGT CTCTGCCCAT TGCCATGTAC 300

TATATTGTCT CCAGGCAGTG GCTCCTCGGA GAGTGGGCCT GCAAACTCTA CATCACCTTT 360

GTGTTCTCTA GCTACTTTGC CAGTAACTGC CTCTTGCTCT TCATCTCTGT GGACCGTTGC 420

ATCTCTGTCC TCTACCCCGT CTGGGCCCTG AACCACCGCA CTGTGCAGCG GGCAGCTGG 480

CTGGCCCTTG GGGTGTGGCT CCTGGCCGCC GCCTTGCTGT CTGCGCACCT GAAATTCCGG 540

25 ACAACCCAGAA AATGGAATGG CTGTACGCAC TGCTACTTGG CGTTCAACTC TGACAATGAG 600

ACTGCCACAGA TTTGATTGTA AGGGGTCGTG GAGGGACACA TTATAGGAC CATTGGCCAC 660

TTCTTCTCTG GCTTCTCTGG GCCCTTAGCA ATCATAGGCA CCTGCGCCCA CCTCATCCGG 720

GCCAAGCTCT TGCGGGAGGG CTGGGTCCAT GCCAACCGGC CCGCGAGGCT GCTGCTGGTG 780

CTGTGTAGCG CTTTCTTTAT CTTCTGTGTC CCGTTTAACG TGGTGTCTGT GGTCCATCTG 840

30 TGGCGACGGG TGATGCTCAA GGAATCTAC CACCCCGGGA TGCTGTCTAT CCTCCAGGCT 900

AGCTTTGCCT TGGGCTGTGT CAACAGCAGC CTCACCCCTT TCCTCTACGT CTTCGTGGC 960

205

AGAGATTTC AAGAAAAGTT TTTCCAGTCT TTGACTTCTG CCCTGGCGAG GCGGTTTGA 1020

GAGGAGGAGT TTCTGTATC CTGTCCCCGT GGCAACGCCC CCCGGGAATG A 1071

(247) INFORMATION FOR SEQ ID NO:246:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 356 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant
- (ii) MOLECULE TYPE: protein
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:246:
- | | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Asn | Gly | Val | Ser | Glu | Gly | Thr | Arg | Gly | Cys | Ser | Asp | Arg | Gln | Pro | 1 | 5 | 10 | 15 |
| Gly | Val | Leu | Thr | Arg | Asp | Arg | Ser | Cys | Ser | Arg | Lys | Met | Asn | Ser | Ser | 20 | 25 | 30 | |
| Gly | Cys | Leu | Ser | Glu | Glu | Val | Gly | Ser | Leu | Arg | Pro | Leu | Thr | Val | Val | 35 | 40 | 45 | |
| Ile | Leu | Ser | Ala | Ser | Ile | Val | Val | Gly | Val | Leu | Gly | Asn | Gly | Leu | Val | 50 | 55 | 60 | |
| Leu | Trp | Met | Thr | Val | Phe | Arg | Met | Ala | Arg | Thr | Val | Ser | Thr | Val | Cys | 65 | 70 | 75 | 80 |
| Phe | Phe | His | Leu | Ala | Leu | Ala | Asp | Phe | Met | Leu | Ser | Leu | Ser | Leu | Pro | 85 | 90 | 95 | |
| Ile | Ala | Met | Tyr | Tyr | Ile | Val | Ser | Arg | Gln | Trp | Leu | Leu | Gly | Glu | Trp | 100 | 105 | 110 | |
| Ala | Cys | Lys | Leu | Tyr | Ile | Thr | Phe | Val | Phe | Leu | Ser | Tyr | Phe | Ala | Ser | 115 | 120 | 125 | |
| Asn | Cys | Leu | Leu | Val | Phe | Ile | Ser | Val | Asp | Arg | Cys | Ile | Ser | Val | Leu | 130 | 135 | 140 | |
| Tyr | Pro | Val | Trp | Ala | Leu | Asn | His | Arg | Thr | Val | Gln | Arg | Ala | Ser | Trp | 145 | 150 | 155 | 160 |
| Leu | Ala | Phe | Gly | Val | Trp | Leu | Leu | Ala | Ala | Ala | Leu | Cys | Ser | Ala | His | 165 | 170 | 175 | |
| Leu | Lys | Phe | Arg | Thr | Thr | Arg | Lys | Trp | Asn | Gly | Cys | Thr | His | Cys | Tyr | 180 | 185 | 190 | |
| Leu | Ala | Phe | Asn | Ser | Asp | Asn | Glu | Thr | Ala | Gln | Ile | Trp | Ile | Glu | Gly | 195 | 200 | 205 | |

206

Val Val Glu Gly His Ile Ile Gly Thr Ile Gly His Phe Leu Leu Gly
 210 215 220

Phe Leu Gly Pro Leu Ala Ile Ile Gly Thr Cys Ala His Leu Ile Arg
 225 230 235 240

5 Ala Lys Leu Leu Arg Glu Gly Trp Val His Ala Asn Arg Pro Ala Arg
 245 250 255

Leu Leu Leu Val Leu Val Ser Ala Phe Phe Ile Phe Trp Ser Pro Phe
 260 265 270

10 Asn Val Val Leu Leu Val His Leu Trp Arg Arg Val Met Leu Lys Glu
 275 280 285

Ile Tyr His Pro Arg Met Leu Leu Ile Leu Gln Ala Ser Phe Ala Leu
 290 295 300

Gly Cys Val Asn Ser Ser Leu Asn Pro Phe Leu Tyr Val Phe Val Gly
 305 310 315 320

15 Arg Asp Phe Gln Glu Lys Phe Phe Gln Ser Leu Thr Ser Ala Leu Ala
 325 330 335

Arg Ala Phe Gly Glu Glu Glu Phe Leu Ser Ser Cys Pro Arg Gly Asn
 340 345 350

20 Ala Pro Arg Glu
 355

(248) INFORMATION FOR SEQ ID NO:247:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 32 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:247:

GCAGAAATTCG GCGGCCCCAT GGACCTGCCC CC

32

30 (249) INFORMATION FOR SEQ ID NO:248:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 30 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:248:

35

GCTGGATCCC CCGAGCAGTG GCGTTACTTC

30

(250) INFORMATION FOR SEQ ID NO:249:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 903 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:249:

10 ATGGACCTGC CCCCGCAGCT CTCCTTCGGC CTCATGTGG CCGCCTTTGC GCTGGGCTTC 60
 CCGCTCAACG TCCTGGCCAT CCGAGGCGCG ACGGCCACG CCCGGCTCCG TCTACCCCT 120
 AGCCTGGTCT ACGCCCTGAA CCTGGGCTGC TCCGACCTGC TGCTGACAGT CTCTCTGCCC 180
 CTGAAGGCGG TGGAGGCGCT AGCCTCCGGG GCCTGGCCTC TGCCGGCCTC GCTGTGCCCC 240
 GTCTTCGCGG TGGCCCACTT CTCCCACTC TATGCCGGCG GGGGCTTCCT GGCCGCCCTG 300
 15 AGTGACGCC GCTACCTGGG AGCAGCCTTC CCCTTGGGCT ACCAAGCCTT CCGGAGGCCG 360
 TGCTATTCTT GGGGGGTGTG CGGGGCCATC TGGGCCCTCG TCCTGTGTCA CCTGGGCTCG 420
 GTCTTTGGGT TGGAGGCTCC AGGAGGCTGG CTGGACCACA GCAACACCTC CCTGGGCATC 480
 AACACACCGG TCAACGGCTC TCCGGTCTGC CTGGAGGCTT GGGACCCGGC CTCTGCCGGC 540
 CCGGCCCGCT TCAGCCTCTC TCTCTGCTC TTTTTCCTGC CCTTGGCCAT CACAGCCTTC 600
 20 TGCTACGTGG GCTGCCTCCG GGCCTGGCC CGCTCCGGCG TGACGCACAG GCGGAAGCTG 660
 CGGGCCGCTT GGGTGGCCGG CGGGGCCCTC CTCACGCTGC TGCTCTGCGT AGGACCTTAC 720
 AACGCCTCCA ACGTGGCCAG CTTCTGTGAC CCAATCTAG GAGGCTCCTG GCGGAAGCTG 780
 GGGCTCATCA CGGGTGCTCG GAGTGTGGTG CTTAATCCG TGGTGACCGG TTACTTGGGA 840
 AGGGGTCCTG GCCTGAAGAC AGTGTGTGCG GCAAGAACGC AAGGGGGCAA GTCCAGAAG 900
 25 TAA 903

(251) INFORMATION FOR SEQ ID NO:250:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 300 amino acids

(B) TYPE: amino acid

(C) STRANDEDNESS:

(D) TOPOLOGY: not relevant

30

208

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:250:

Met Asp Leu Pro Pro Gln Leu Ser Phe Gly Leu Tyr Val Ala Ala Phe
 1 5 10 15
 5 Ala Leu Gly Phe Pro Leu Asn Val Leu Ala Ile Arg Gly Ala Thr Ala
 20 25 30
 His Ala Arg Leu Arg Leu Thr Pro Ser Leu Val Tyr Ala Leu Asn Leu
 35 40 45
 10 Gly Cys Ser Asp Leu Leu Leu Thr Val Ser Leu Pro Leu Lys Ala Val
 50 55 60
 Glu Ala Leu Ala Ser Gly Ala Trp Pro Leu Pro Ala Ser Leu Cys Pro
 65 70 75 80
 Val Phe Ala Val Ala His Phe Phe Pro Leu Tyr Ala Gly Gly Gly Phe
 85 90 95
 15 Leu Ala Ala Leu Ser Ala Gly Arg Tyr Leu Gly Ala Ala Phe Pro Leu
 100 105 110
 Gly Tyr Gln Ala Phe Arg Arg Pro Cys Tyr Ser Trp Gly Val Cys Ala
 115 120 125
 20 Ala Ile Trp Ala Leu Val Leu Cys His Leu Gly Leu Val Phe Gly Leu
 130 135 140
 Glu Ala Pro Gly Gly Trp Leu Asp His Ser Asn Thr Ser Leu Gly Ile
 145 150 155 160
 Asn Thr Pro Val Asn Gly Ser Pro Val Cys Leu Glu Ala Trp Asp Pro
 165 170 175
 25 Ala Ser Ala Gly Pro Ala Arg Phe Ser Leu Ser Leu Leu Phe Phe
 180 185 190
 Leu Pro Leu Ala Ile Thr Ala Phe Cys Tyr Val Gly Cys Leu Arg Ala
 195 200 205
 30 Leu Ala Arg Ser Gly Leu Thr His Arg Arg Lys Leu Arg Ala Ala Trp
 210 215 220
 Val Ala Gly Gly Ala Leu Leu Thr Leu Leu Cys Val Gly Pro Tyr
 225 230 235 240
 Asn Ala Ser Asn Val Ala Ser Phe Leu Tyr Pro Asn Leu Gly Gly Ser
 245 250 255
 35 Trp Arg Lys Leu Gly Leu Ile Thr Gly Ala Trp Ser Val Val Leu Asn
 260 265 270
 Pro Leu Val Thr Gly Tyr Leu Gly Arg Gly Pro Gly Leu Lys Thr Val

209

275

280

285

Cys Ala Ala Arg Thr Gln Gly Gly Lys Ser Gln Lys
 290 295 300

(252) INFORMATION FOR SEQ ID NO:251:

- 5 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 31 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- 10 (ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:251:

CTCAAGCTTA CTCTCTCTCA CCAGTGGCCA C 31

(253) INFORMATION FOR SEQ ID NO:252:

- 15 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 24 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)

20 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:252:

CCCTCCTCCC CCGGAGGACC TAGC 24

(254) INFORMATION FOR SEQ ID NO:253:

- 25 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 1041 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:253:
- 30 ATGGATACAG GCCCCGACCA GTCTACTTC TCCGGCAATC ACTGGTTCGT CTTCTCGGTG 60
 TACCTTCTCA CTTTCCTGCT GGGGCTCCCC CTCAACCTGC TGGCCCTGGT GGTCTTCGTG 120
 GGCAAGCTGC AGCGCCGCC GGTGGCCSTG GACGTGCTCC TGCTCAACCT GACCGCCTCG 180
 GACCTGCTCC TGCTGTGTT CTTGCCTTTC CGCATGGTGG AGGCAGCCAA TGGCATGCAC 240
 TGGCCCCTGC CCTTCATCCT CTGCCCACTC TCTGGATTCA TCTTCTTCAC CACCATCTAT 300

210

CTCACCGCCC TCITCCTGGC AGCTGTGAGC ATTGAACGCT TCCTGAGTGT GGCCACCCCA 360
 CTGTGGTACA AGACCCGGCC GAGGCTGGGG CAGGCAGGTC TGCTGAGTGT GGCTGTCTGG 420
 CTGTTGGCCT CTGCTCACTG CAGCGTGGTC TACGTCATAG AATTCTCAGG GGACATCTCC 480
 CACAGCCAGG GCACCAATGG GACCTGCTAC CTGGAGTTCC GGAAGGACCA GCTAGCCATC 540
 5 CTCCTGCCCG TGCGGCTGGA GATGGCTGTG GTCCTCTTTG TGGTCCCCTG GATCATCACC 600
 AGCTACTGCT ACAGCCGCCT GGTGTGGATC CTCGGCAGAG GGGGCAGCCA CCGCCGGCAG 660
 AGGAGGGTGG CGGGGCTGTT GCGGCCACG CTGCTCAACT TCCITGTCTG CTTTGGGCCC 720
 TACAACGTGT CCCATGTCGT GGGCTATATC TCGCGTGAAA GCCCGGCATG GAGGATCTAC 780
 GTGACGCTTC TCAGCACCTT GAACTCCTGT GTCGACCCCT TTGTCTACTA CTTCCTCTCC 840
 10 TCCGGGTTC AAGCCGACTT TCATGAGCTG CTGAGGAGGT TGTGTGGGCT CTGGGGCCAG 900
 TGGCAGCAGG AGAGCAGCAT GGAGCTGAAG GAGCAGAAGG GAGGGGAGGA GCAGAGAGCG 960
 GACCGACCAG CTGAAAGAAA GACCAAGTGA CACTCACAGG GCTGTGGAAC TGGTGGCCAG 1020
 GTGGCCTGTG CTGAAAGCTA G 1041

(255) INFORMATION FOR SEQ ID NO:254:

- 15 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 346 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

- 20 (ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:254:

Met Asp Thr Gly Pro Asp Gln Ser Tyr Phe Ser Gly Asn His Trp Phe
 1 5 10 15
 Val Phe Ser Val Tyr Leu Leu Thr Phe Leu Val Gly Leu Pro Leu Asn
 20 25 30
 Leu Leu Ala Leu Val Val Phe Val Gly Lys Leu Gln Arg Arg Pro Val
 35 40 45
 Ala Val Asp Val Leu Leu Asn Leu Thr Ala Ser Asp Leu Leu Leu
 50 55 60
 30 Leu Leu Phe Leu Pro Phe Arg Met Val Glu Ala Asn Gly Met His
 65 70 75 80
 Trp Pro Leu Pro Phe Ile Leu Cys Pro Leu Ser Gly Phe Ile Phe Phe
 85 90 95

211

	Thr	Thr	Ile	Tyr	Leu	Thr	Ala	Leu	Phe	Leu	Ala	Ala	Val	Ser	Ile	Glu	
					100					105					110		
	Arg	Phe	Leu	Ser	Val	Ala	His	Pro	Leu	Trp	Tyr	Lys	Thr	Arg	Pro	Arg	
			115					120					125				
5	Leu	Gly	Gln	Ala	Gly	Leu	Val	Ser	Val	Ala	Cys	Trp	Leu	Leu	Ala	Ser	
		130				135						140					
	Ala	His	Cys	Ser	Val	Val	Tyr	Val	Ile	Glu	Phe	Ser	Gly	Asp	Ile	Ser	
	145					150					155				160		
10	His	Ser	Gln	Gly	Thr	Asn	Gly	Thr	Cys	Tyr	Leu	Glu	Phe	Arg	Lys	Asp	
					165					170					175		
	Gln	Leu	Ala	Ile	Leu	Leu	Pro	Val	Arg	Leu	Glu	Met	Ala	Val	Val	Leu	
					180				185					190			
	Phe	Val	Val	Pro	Leu	Ile	Ile	Thr	Ser	Tyr	Cys	Tyr	Ser	Arg	Leu	Val	
		195						200					205				
15	Trp	Ile	Leu	Gly	Arg	Gly	Gly	Ser	His	Arg	Arg	Gln	Arg	Arg	Val	Ala	
	210					215						220					
	Gly	Leu	Leu	Ala	Ala	Thr	Leu	Leu	Asn	Phe	Leu	Val	Cys	Phe	Gly	Pro	
	225					230					235				240		
20	Tyr	Asn	Val	Ser	His	Val	Val	Gly	Tyr	Ile	Cys	Gly	Glu	Ser	Pro	Ala	
					245					250					255		
	Trp	Arg	Ile	Tyr	Val	Thr	Leu	Leu	Ser	Thr	Leu	Asn	Ser	Cys	Val	Asp	
			260						265					270			
	Pro	Phe	Val	Tyr	Tyr	Phe	Ser	Ser	Ser	Gly	Phe	Gln	Ala	Asp	Phe	His	
		275					280					285					
25	Glu	Leu	Leu	Arg	Arg	Leu	Cys	Gly	Leu	Trp	Gly	Gln	Trp	Gln	Gln	Glu	
		290				295						300					
	Ser	Ser	Met	Glu	Leu	Lys	Glu	Gln	Lys	Gly	Gly	Glu	Glu	Gln	Arg	Ala	
	305				310					315					320		
30	Asp	Arg	Pro	Ala	Glu	Arg	Lys	Thr	Ser	Glu	His	Ser	Gln	Gly	Cys	Gly	
				325						330					335		
	Thr	Gly	Gly	Gln	Val	Ala	Cys	Ala	Glu	Ser							
				340					345								

(256) INFORMATION FOR SEQ ID NO:255:

- (i) SEQUENCE CHARACTERISTICS:
- 35 (A) LENGTH: 31 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

- (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:255:
- TTTAAGCTTC CCCTCCAGGA TGCTGCCGGA C 31
- (257) INFORMATION FOR SEQ ID NO:256:
- 5 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 31 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: not relevant
- 10 (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:256:
- GGCGAATCTT GAAGTCCAG GGAACTGCT A 31
- (258) INFORMATION FOR SEQ ID NO:257:
- 15 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 993 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- 20 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:257:
- ATGCTGCCGG ACTGGAAGAG CTCCTTGATC CTCATGGCTT ACATCATCAT CTCCTCACT 60
- GGCCTCCCTG CCAACCTCCT GGCCCTGGCG GCCTTTGTGG GCGGATCCG CCAGCCCCAG 120
- CCTGCACCTG TGCACATCCT CCTGCTGAGC CTGACGCTGG CCGACCTCCT CCTGCTGCTG 180
- CTGCTGCCCT TCAAGATCAT CGAGGCTGCG TCGAACTTCC GCTGGTACCT GCCCAAGGTC 240
- 25 GTCTGCGCCC TCACGAGTTT TGGCTTCTAC AGCAGCATCT ACTGCAGCAC GTGCTCTCTG 300
- GCGGGCATCA GCATCGAGCG CTACCTGGGA GTGGCTTTCC CCGTGCACTA CAAGCTCTCC 360
- CGCCGGCCTC TGTATGGAGT GATTGCAGCT CTGGTGGCCT GGGTTATGTC CTTTGGTCAC 420
- TGCACCATCG TGATCATCGT TCAATACTTG AACACGACTG AGCAGGTCAG AAGTGGCAAT 480
- GAAATTACCT GCTACGAGAA CTTACCGGAT AACCAGTTGG ACGTGGTGCT GCCCGTGCGG 540
- 30 CTGGAGCTGT GCCTGGTGCT CTTCTTCATC CCCATGGCAG TCACCATCTT CTGCTACTGG 600
- CGTTTGTGTG GGATCATGCT CTCCCAGCCC CTTGTGGGGG CCCAGAGGCG GCGCCGAGCC 660
- GTGGGGCTGG CTGTGTGAC GCTGCTCAAT TTCTGGTGT GCTTCGGACC TTACAACGTG 720

213

TCCCACCTGG TGGGGTATCA CCAGAGAAAA AGCCCTGGT GCGGGTCAAT AGCCGTGGTG 780
 TTCAGTTCAC TCAACGCCAG TCTGGACCCC CTGCTCTTCT ATTTCTCTTC TTCAGTGGTG 840
 CGCAGGGCAT TTGGGAGAGG GCTGCAGGTG CTGCGGAATC AGGGCTCCTC CTGTGTGGGA 900
 CGCAGAGGCA AAGACACAGC AGAGGGGACA AATGAGGACA GGGGTGTGGG TCAAGGAGAA 960
 5 GGGATGCCAA GTTCGGACTT CACTACAGAG TAG 993

(259) INFORMATION FOR SEQ ID NO:258:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 362 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:258:

15 Met Leu Pro Asp Trp Lys Ser Ser Leu Ile Leu Met Ala Tyr Ile Ile
 1 5 10 15
 Ile Phe Leu Thr Gly Leu Pro Ala Asn Leu Leu Ala Leu Arg Ala Phe
 20 25 30
 Val Gly Arg Ile Arg Gln Pro Gln Pro Ala Pro Val His Ile Leu Leu
 35 40 45
 20 Leu Ser Leu Thr Leu Ala Asp Leu Leu Leu Leu Leu Leu Pro Phe
 50 55 60
 Lys Ile Ile Glu Ala Ala Ser Asn Phe Arg Trp Tyr Leu Pro Lys Val
 65 70 75 80
 25 Val Cys Ala Leu Thr Ser Phe Gly Phe Tyr Ser Ser Ile Tyr Cys Ser
 85 90 95
 Thr Trp Leu Leu Ala Gly Ile Ser Ile Glu Arg Tyr Leu Gly Val Ala
 100 105 110
 Phe Pro Val Gln Tyr Lys Leu Ser Arg Arg Pro Leu Tyr Gly Val Ile
 115 120 125
 30 Ala Ala Leu Val Ala Trp Val Met Ser Phe Gly His Cys Thr Ile Val
 130 135 140
 Ile Ile Val Gln Tyr Leu Asn Thr Thr Glu Gln Val Arg Ser Gly Asn
 145 150 155 160
 35 Glu Ile Thr Cys Tyr Glu Asn Phe Thr Asp Asn Gln Leu Asp Val Val
 165 170 175

214

Leu Pro Val Arg Leu Glu Leu Cys Leu Val Leu Phe Phe Ile Pro Met
 180 185 190
 Ala Val Thr Ile Phe Cys Tyr Trp Arg Phe Val Trp Ile Met Leu Ser
 195 200 205
 5 Gln Pro Leu Val Gly Ala Gln Arg Arg Arg Ala Val Gly Leu Ala
 210 215 220
 Val Val Thr Leu Leu Asn Phe Leu Val Cys Phe Gly Pro Tyr Asn Val
 225 230 235 240
 10 Ser His Leu Val Gly Tyr His Gln Arg Lys Ser Pro Trp Trp Arg Ser
 245 250 255
 Ile Ala Val Val Phe Ser Ser Leu Asn Ala Ser Leu Asp Pro Leu Leu
 260 265 270
 Phe Tyr Phe Ser Ser Ser Val Val Arg Arg Ala Phe Gly Arg Gly Leu
 275 280 285
 15 Gln Val Leu Arg Asn Gln Gly Ser Ser Leu Leu Gly Arg Arg Gly Lys
 290 295 300
 Asp Thr Ala Glu Gly Thr Asn Glu Asp Arg Gly Val Gly Gln Gly Glu
 305 310 315 320
 20 Gly Met Pro Ser Ser Asp Phe Thr Thr Glu
 325 330

(260) INFORMATION FOR SEQ ID NO:259:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 30 base pairs
 (B) TYPE: nucleic acid
 25 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
 (ii) MOLECULE TYPE: DNA (genomic)
 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:259:

CCCAAGCTTC GGGCACCATG GACACCTCCC

30

30 (261) INFORMATION FOR SEQ ID NO:260:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 30 base pairs
 (B) TYPE: nucleic acid
 35 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
 (ii) MOLECULE TYPE: DNA (genomic)
 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:260:

ACAGGATCCA AATGCACAGC ACTGGTAAGC 30

(262) INFORMATION FOR SEQ ID NO:261:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 25 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:261:

CTATAACTGG GTTACATGGT TTAAC 25

(263) INFORMATION FOR SEQ ID NO:262:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 30 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:262:

TTTGAATTCA CATATTAATT AGAGACATGG 30

(264) INFORMATION FOR SEQ ID NO:263:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 2724 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:263:

ATGGACACCT CCCGGCTCGG TGTGCTCCTG TCCTTGCCCTG TGCTGCTGCA GCTGGCGACC 60

GGGGGCAGCT CTCCCAGGTC TGGTGTGTTG CTGAGGGGCT GCCCCACACA CTGTCATTGC 120

GAGCCCCAGC GCAGGATGTT GCTCAGGGTG GACTGCTCCG ACCTGGGGCT CTCGGAGCTG 180

CCTTCCAACC TCAGCGTCTT CACCTCCTAC CTAGACCTCA GTATGAACAA CATCAGTCAG 240

CTGCTCCCGA ATCCCCTGCC CAGTCTCCGC TTCTGTGAGG AGTTACGTCT TGC GGGAAC 300

GCTCTGACAT ACATTCCCAA GGGAGCATTG ACTGGCCTTT ACAGTCTTAA AGTTCTTATG 360

	CTGCAGAATA ATCAGCTAAG ACACGTACCC ACAGAAGCTC TGCAGAATTT GCGAAGCCTT	420
	CAATCCCTGC GTCTGGATGC TAACCACATC AGCTATGTGC CCCCAAGCTG TTTCAGTGGC	480
	CTGCATTCCC TGAGGCACCT GTGGCTGGAT GACAATGCGT TAACAGAAAT CCCCGTCCAG	540
	GCTTTTAGAA GTTTATCGGC ATTGCAAGCC ATGACCTTGG CCCTGAACAA AATACACCAC	600
5	ATACCAGACT ATGCCTTTGG AAACCTCTCC AGCTTGGTAG TTCTACATCT CCATAACAAT	660
	AGAATCCACT CCCTGGGAAA GAAATGCTTT GATGGGCTCC ACAGCCTAGA GACTTTAGAT	720
	TTAAATTACA ATAACCTTGA TGAATTCCCC ACTGCAATTA GGACACTCTC CAACCTTAAA	780
	GAAGTAGGAT TTCATAGCAA CAATATCAGG TCGATACCTG AGAAAGCATT TGTAGGCAAC	840
	CCTTCTCTTA TTACAATACA TTCTATGAC AATCCCATCC AATTGTGTGG GAGATCTGCT	900
10	TTTCAACATT TACCTGAAGT AAGAACACTG ACTCTGAATG GTGCCTCACA AATAACTGAA	960
	TTTCCGTGATT TAACTGGAAC TGCAAACTG GAGAGTCTGA CTTTAAGTGG AGCACAGATC	1020
	TCATCTCTTC CTCAAACCGT TCGCAATCAG TTACCTAATC TCCAAGTGTCT AGATCTGTCT	1080
	TACAACCTAT TAGAAGATTT ACCCAGTTTT TCAGTCTGCC AAAAGCTTCA GAAAATTGAC	1140
	CTAAGACATA ATGAAATCTA CGAAATTAAA GTTGACACTT TCCAGCAGTT GCTTAGCCTC	1200
15	CGATCGCTGA ATTTGGCTTG GAACAAAATT GCTATTATTC ACCCCAATGC ATTTTCCACT	1260
	TTGCCATCCC TAATAAAGCT GGACCTATCG TCCAACCTCC TGTCGCTCTT TCCTATAACT	1320
	GGGTTACATG GTTTAACTCA CTTAAAATTA ACAGGAAATC ATGCCCTTACA GAGCTTGATA	1380
	TCATCTGAAA ACTTTCCAGA ACTCAAGGTT ATAGAAATGC CTTATGCTTA CCAGTGTCTGT	1440
	GCATTGGAGG TGTGTGAGAA TGCCATAAAG ATTTCTAATC AATGGAATAA AGGTGACAAC	1500
20	AGCAGTAGG ACGACCTTCA TAAGAAAGAT GCTGGAATGT TTCAGGCTCA AGATGAACGT	1560
	GACCTTGAAG ATTTCTGTCT TGACTTTGAG GAAGACCTGA AAGCCCTTCA TTCAGTGAG	1620
	TGTTACACCT CCCCAGGCC CTTCAAACCC TGTGAACACC TGCTTGATGG CTGGCTGATC	1680
	AGAATTGGAG TGTGGACCAT AGCAGTTCTG GCACTTACTT GTAATGCTTT GGTGACTTCA	1740
	ACAGTTTICA GATCCCTCT GTACATTTC CCCATTAAAC TGTTAATTGG GGTATCGCA	1800
25	CGAGTGAACA TGCTCACGGG AGTCTCCAGT GCCGTGCTGG CTGGTGTGGA TGCCTTCACT	1860
	TTTGCGACGT TTGCACGACA TGGTGCTGG TGGGAGAATG GGGTTGGTTG CCAATGTCATT	1920
	GGTTTTTTGT CCATTTTTGC TTCAGAAATCA TCTGTTTTCC TGCTTACTCT GGCAGCCCTG	1980
	GAGCGTGGT TCTCTGTGAA ATATTCTGCA AAATTTGAAA CGAAAGCTCC ATTTTCTAGC	2040

CTGAAAGTAA TCATTTTGCT CTGTGCCCTG CTGGCCTTGA CCATGGCCGC AGTCCCCCTG 2100
 CTGGGTGGCA GCAAGTATGG CGCCTCCCCT CTCTGCCTGC CTTTGCCTTT TGGGAGAGCC 2160
 AGCACCATGG GCTACATGGT CGCTCTCATC TTGCTCAATT CCCTTTGCTT CCTCATGATG 2220
 ACCATTGCCT ACACCAAGCT CTACTGCAAT TTGGACAAGG GAGACCTGGA GAATATTTTG 2280
 5 GACTGCTCTA TGGTAAACA CATTGCCCTG TTGCTCTTCA CCAACTGCAT CCTAACTGC 2340
 CCTGTGGCCT TCTTGCTCTT CTCTCTTTA ATAAACCTTA CATTTATCAG TCCTGAAGTA 2400
 ATTAAGTTTA TCCTTCTGGT GGTAGTCCCA CTCTCTGCAT GTCTCAATCC CCTTCTCTAC 2460
 ATCTTGTTC AATCTCACTT TAAGGAGGAT CTGGTGAGCC TGAGAAAGCA AACCTACGTC 2520
 TGGACAAGAT CAAACACCC AAGCTTGATG TCAATTAACCT CTGATGATGT CGAAAAACAG 2580
 10 TCCTGTGACT CAACTCAAGC CTTGGTAACC TTACCAGCT CCAGCATCAC TTATGACCTG 2640
 CCTCCAGATT CCGTGCCATC ACCAGCTTAT CCAGTGACTG AGAGCTGCCA TCTTCTCTCT 2700
 GTGGCATTTG TCCCATGTCT CTAA 2724

(265) INFORMATION FOR SEQ ID NO:264:

- (i) SEQUENCE CHARACTERISTICS:
 15 (A) LENGTH: 907 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

- 20 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:264:

Met Asp Thr Ser Arg Leu Gly Val Leu Leu Ser Leu Pro Val Leu Leu
 1 5 10 15
 Gln Leu Ala Thr Gly Gly Ser Ser Pro Arg Ser Gly Val Leu Leu Arg
 20 25 30
 25 Gly Cys Pro Thr His Cys His Cys Glu Pro Asp Gly Arg Met Leu Leu
 35 40 45
 Arg Val Asp Cys Ser Asp Leu Gly Leu Ser Glu Leu Pro Ser Asn Leu
 50 55 60
 30 Ser Val Phe Thr Ser Tyr Leu Asp Leu Ser Met Asn Asn Ile Ser Gln
 65 70 75 80
 Leu Leu Pro Asn Pro Leu Pro Ser Leu Arg Phe Leu Glu Glu Leu Arg
 85 90 95
 Leu Ala Gly Asn Ala Leu Thr Tyr Ile Pro Lys Gly Ala Phe Thr Gly

218

		100		105		110	
	Leu Tyr Ser	Leu Lys Val	Leu Met	Leu Gln Asn	Asn Gln	Leu Arg His	
	115		120		125		
5	Val Pro Thr	Glu Ala	Leu Gln Asn	Leu Arg Ser	Leu Gln Ser	Leu Arg	
	130		135		140		
	Leu Asp Ala	Asn His Ile	Ser Tyr Val	Pro Pro	Ser Cys Phe	Ser Gly	
	145	150		155		160	
	Leu His Ser	Leu Arg His	Leu Trp	Leu Asp Asn	Ala Leu Thr	Glu	
		165		170		175	
10	Ile Pro Val	Gln Ala Phe	Arg Ser	Leu Ser Ala	Leu Gln Ala	Met Thr	
		180		185		190	
	Leu Ala Leu	Asn Lys Ile His	His Ile	Pro Asp Tyr	Ala Phe Gly	Asn	
		195	200		205		
15	Leu Ser Ser	Leu Val Val	Leu His Leu	His Asn Asn	Arg Ile His	Ser	
	210		215		220		
	Leu Gly Lys	Lys Cys Phe	Asp Gly Leu	His Ser Leu	Glu Thr Leu	Asp	
	225	230		235		240	
	Leu Asn Tyr	Asn Asn Leu	Asp Glu Phe	Pro Thr Ala	Ile Arg Thr	Leu	
		245		250		255	
20	Ser Asn Leu	Lys Glu Leu	Gly Phe His	Ser Asn Asn	Ile Arg Ser	Ile	
		260		265		270	
	Pro Glu Lys	Ala Phe Val	Gly Asn Pro	Ser Leu Ile	Thr Ile His	Phe	
		275	280		285		
25	Tyr Asp Asn	Pro Ile Gln	Phe Val Gly	Arg Ser Ala	Phe Gln His	Leu	
	290		295		300		
	Pro Glu Leu	Arg Thr Leu	Thr Leu Asn	Gly Ala Ser	Gln Ile Thr	Glu	
	305	310		315		320	
	Phe Pro Asp	Leu Thr Gly	Thr Ala Asn	Leu Glu Ser	Leu Thr Leu	Thr	
		325		330		335	
30	Gly Ala Gln	Ile Ser Ser	Leu Pro Gln	Thr Val Cys	Asn Gln Leu	Pro	
		340		345		350	
	Asn Leu Gln	Val Leu Asp	Leu Ser Tyr	Asn Leu Leu	Glu Asp Leu	Pro	
		355	360		365		
35	Ser Phe Ser	Val Cys Gln	Lys Leu Gln	Lys Ile Asp	Leu Arg His	Asn	
	370		375		380		
	Glu Ile Tyr	Glu Ile Lys	Val Asp Thr	Phe Gln Gln	Leu Leu Ser	Leu	
	385	390		395		400	

219

Arg Ser Leu Asn Leu Ala Trp Asn Lys Ile Ala Ile Ile His Pro Asn
 405 410 415
 Ala Phe Ser Thr Leu Pro Ser Leu Ile Lys Leu Asp Leu Ser Ser Asn
 420 425 430
 5 Leu Leu Ser Ser Phe Pro Ile Thr Gly Leu His Gly Leu Thr His Leu
 435 440 445
 Lys Leu Thr Gly Asn His Ala Leu Gln Ser Leu Ile Ser Ser Glu Asn
 450 455 460
 10 Phe Pro Glu Leu Lys Val Ile Glu Met Pro Tyr Ala Tyr Gln Cys Cys
 465 470 475 480
 Ala Phe Gly Val Cys Glu Asn Ala Tyr Lys Ile Ser Asn Gln Trp Asn
 485 490 495
 Lys Gly Asp Asn Ser Ser Met Asp Asp Leu His Lys Lys Asp Ala Gly
 500 505 510
 15 Met Phe Gln Ala Gln Asp Glu Arg Asp Leu Glu Asp Phe Leu Leu Asp
 515 520 525
 Phe Glu Glu Asp Leu Lys Ala Leu His Ser Val Gln Cys Ser Pro Ser
 530 535 540
 20 Pro Gly Pro Phe Lys Pro Cys Glu His Leu Leu Asp Gly Trp Leu Ile
 545 550 555 560
 Arg Ile Gly Val Trp Thr Ile Ala Val Leu Ala Leu Thr Cys Asn Ala
 565 570 575
 Leu Val Thr Ser Thr Val Phe Arg Ser Pro Leu Tyr Ile Ser Pro Ile
 580 585 590
 25 Lys Leu Leu Ile Gly Val Ile Ala Ala Val Asn Met Leu Thr Gly Val
 595 600 605
 Ser Ser Ala Val Leu Ala Gly Val Asp Ala Phe Thr Phe Gly Ser Phe
 610 615 620
 30 Ala Arg His Gly Ala Trp Trp Glu Asn Gly Val Gly Cys His Val Ile
 625 630 635 640
 Gly Phe Leu Ser Ile Phe Ala Ser Glu Ser Ser Val Phe Leu Leu Thr
 645 650 655
 Leu Ala Ala Leu Glu Arg Gly Phe Ser Val Lys Tyr Ser Ala Lys Phe
 660 665 670
 35 Glu Thr Lys Ala Pro Phe Ser Ser Leu Lys Val Ile Ile Leu Leu Cys
 675 680 685
 Ala Leu Leu Ala Leu Thr Met Ala Ala Val Pro Leu Leu Gly Gly Ser

220

	690		695		700
	Lys Tyr Gly Ala Ser	Pro Leu Cys Leu	Pro Leu Phe Gly Glu Pro		
	705	710	715	720	
5	Ser Thr Met Gly Tyr	Met Val Ala Leu Ile	Leu Leu Asn Ser Leu Cys		
		725	730	735	
	Phe Leu Met Met Thr	Ile Ala Tyr Thr Lys Leu Tyr Cys Asn Leu Asp			
		740	745	750	
	Lys Gly Asp Leu Glu Asn Ile Trp	Asp Cys Ser Met Val Lys His Ile			
		755	760	765	
10	Ala Leu Leu Leu Phe Thr	Asn Cys Ile Leu Asn Cys Pro Val Ala Phe			
		770	775	780	
	Leu Ser Phe Ser Ser Leu Ile Asn Leu Thr Phe Ile Ser Pro Glu Val				
		785	790	795	800
15	Ile Lys Phe Ile Leu Leu Val Val Val Pro Leu Pro Ala Cys Leu Asn				
		805	810	815	
	Pro Leu Leu Tyr Ile Leu Phe Asn Pro His Phe Lys Glu Asp Leu Val				
		820	825	830	
	Ser Leu Arg Lys Gln Thr Tyr Val Trp Thr Arg Ser Lys His Pro Ser				
		835	840	845	
20	Leu Met Ser Ile Asn Ser Asp Asp Val Glu Lys Gln Ser Cys Asp Ser				
		850	855	860	
	Thr Gln Ala Leu Val Thr Phe Thr Ser Ser Ser Ile Thr Tyr Asp Leu				
		865	870	875	880
25	Pro Pro Ser Ser Val Pro Ser Pro Ala Tyr Pro Val Thr Glu Ser Cys				
		885	890	895	
	His Leu Ser Ser Val Ala Phe Val Pro Cys Leu				
		900	905		

(266) INFORMATION FOR SEQ ID NO:265:

- (i) SEQUENCE CHARACTERISTICS:
- 30 (A) LENGTH: 30 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: DNA (genomic)
- 35 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:265:

CGGAAGCTGC GGGCCAAATG GGTGGCCGGC

30

221

- (267) INFORMATION FOR SEQ ID NO:266:
- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 27 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: single
 - (D) TOPOLOGY: linear
 - (ii) MOLECULE TYPE: DNA (genomic)
 - (xi) SEQUENCE DESCRIPTION: SEQ ID NO:266:
CAGAGGAGGG TGAAGGGGCT GTTGGCG 27
- 10 (268) INFORMATION FOR SEQ ID NO:267:
- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 30 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: single
 - (D) TOPOLOGY: linear
 - (ii) MOLECULE TYPE: DNA (genomic)
 - (xi) SEQUENCE DESCRIPTION: SEQ ID NO:267:
GGCGGCGCCG AGCCAAGGGG CTGGCTGTGG 30
- 20 (269) INFORMATION FOR SEQ ID NO:268:
- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 32 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: single
 - (D) TOPOLOGY: linear
 - (ii) MOLECULE TYPE: DNA (genomic)
 - (xi) SEQUENCE DESCRIPTION: SEQ ID NO:268:
GGGACTGCTC TATGAAAAA CACATTGCCC TG 32
- 25 (270) INFORMATION FOR SEQ ID NO:269:
- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 1071 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: single
 - (D) TOPOLOGY: linear
 - (ii) MOLECULE TYPE: DNA (genomic)
 - (xi) SEQUENCE DESCRIPTION: SEQ ID NO:269:
ATGAATGGGG TCTCGGAGGG GACCAGAGGC TGCA GTGACA GGCAACCTGG GGTCCTGACA 60

222

CGTGATCGCT CTTGTTCCAG GAAGATGAAC TCTTCCGGAT GCGTGTCTGA GGAGGTGGGG 120
 TCCCTCCGCC CACTGACTGT GGTATCTCTG TCTGCGTCCA TTGTCGTCGG AGTGTGCGGC 180
 AATGGGCTGG TGCTGTGGAT GACTGTCTTC CGTATGGCAC GCACGGTCTC CACCGTCTGC 240
 TTCTTCCACC TGSCCTTGC CGATTTCATG CTCTCACTGT CTCTGCCCCAT TGCCATGTAC 300
 5 TATATTGTCT CCAGGCAAGT GCTCCTCGGA GAGTGGGCT GCAAACTCTA CATCACCTTT 360
 GTGTTCTCTA GCTACTTTGC CAGTAACTGC CTCCTTGTCT TCATCTCTGT GGACCGTTGC 420
 ATCTCTGTCC TCTACCCCGT CTGGGCCCTG AACCACCGCA CTGTGCAGCG GCGAGCTGG 480
 CTGGCCTTTG GGGTGTGGCT CCTGGCCGCC GCCTTGTGCT CTGCGCACCT GAAATTCCGG 540
 ACAARCCAGAA AATGGAATGG CTGTACGCAC TGCTACTTGG CGTTCAACTC TGACAATGAG 600
 10 ACTGCCCAGA TTGGAATTGA AGGGGTCGTG GAGGGACACA TTATAGGGAC CATTTGGCCAC 660
 TTCTCTGCTG GCTTCTTGGG GCCCTTAGCA ATCATAGGCA CCTGCGCCCA CCTCATCCGG 720
 GCCAAGCTCT TGCGGGAGGG CTGGGTCCAT GCCAACCAGG CCAAGAGGCT GCTGCTGGTG 780
 CTGGTGAGCG CTTTCTTTAT CTTCTGGTCC CCGTTTAAAG TGGTGCTGTT GGTCCATCTG 840
 TGCGCAGGGG TGATGCTCAA GGAATCTAC CACCCCGGGA TGCTGCTCAT CCTCCAGGCT 900
 15 AGCTTTGCCT TGGGCTGTGT CAACAGCAGC CTCRAACCCCT TCCTCTACGT CTTCGTTGGC 960
 AGAGATTTC AAGAAAAGTT TTTCAGTCT TTGACTTCTG CCCTGGCGAG GCGTTTGGGA 1020
 GAGGAGGAGT TTCTGTATC CTGTCCCGT GGCAACGCC CCCGGGAATG A 1071

(271) INFORMATION FOR SEQ ID NO:270:

- 20 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 356 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

- 25 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:270:

Met Asn Gly Val Ser Glu Gly Thr Arg Gly Cys Ser Asp Arg Gln Pro
 1 5 10 15

Gly Val Leu Thr Arg Asp Arg Ser Cys Ser Arg Lys Met Asn Ser Ser
 20 25 30

- 30 Gly Cys Leu Ser Glu Glu Val Gly Ser Leu Arg Pro Leu Thr Val Val
 35 40 45

223

Ile Leu Ser Ala Ser Ile Val Val Gly Val Leu Gly Asn Gly Leu Val
 50 55 60

Leu Trp Met Thr Val Phe Arg Met Ala Arg Thr Val Ser Thr Val Cys
 65 70 75 80

5 Phe Phe His Leu Ala Leu Ala Asp Phe Met Leu Ser Leu Ser Leu Pro
 85 90 95

Ile Ala Met Tyr Tyr Ile Val Ser Arg Gln Trp Leu Leu Gly Glu Trp
 100 105 110

10 Ala Cys Lys Leu Tyr Ile Thr Phe Val Phe Leu Ser Tyr Phe Ala Ser
 115 120 125

Asn Cys Leu Leu Val Phe Ile Ser Val Asp Arg Cys Ile Ser Val Leu
 130 135 140

Tyr Pro Val Trp Ala Leu Asn His Arg Thr Val Gln Arg Ala Ser Trp
 145 150 155 160

15 Leu Ala Phe Gly Val Trp Leu Leu Ala Ala Ala Leu Cys Ser Ala His
 165 170 175

Leu Lys Phe Arg Thr Thr Arg Lys Trp Asn Gly Cys Thr His Cys Tyr
 180 185 190

20 Leu Ala Phe Asn Ser Asp Asn Glu Thr Ala Gln Ile Trp Ile Glu Gly
 195 200 205

Val Val Glu Gly His Ile Ile Gly Thr Ile Gly His Phe Leu Leu Gly
 210 215 220

Phe Leu Gly Pro Leu Ala Ile Ile Gly Thr Cys Ala His Leu Ile Arg
 225 230 235 240

25 Ala Lys Leu Leu Arg Glu Gly Trp Val His Ala Asn Arg Pro Lys Arg
 245 250 255

Leu Leu Leu Val Leu Val Ser Ala Phe Phe Ile Phe Trp Ser Pro Phe
 260 265 270

30 Asn Val Val Leu Leu Val His Leu Trp Arg Arg Val Met Leu Lys Glu
 275 280 285

Ile Tyr His Pro Arg Met Leu Leu Ile Leu Gln Ala Ser Phe Ala Leu
 290 295 300

Gly Cys Val Asn Ser Ser Leu Asn Pro Phe Leu Tyr Val Phe Val Gly
 305 310 315 320

35 Arg Asp Phe Gln Glu Lys Phe Phe Gln Ser Leu Thr Ser Ala Leu Ala
 325 330 335

Arg Ala Phe Gly Glu Glu Glu Phe Leu Ser Ser Cys Pro Arg Gly Asn

224

340

345

350

Ala Pro Arg Glu
355

(272) INFORMATION FOR SEQ ID NO:271:

- 5 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 903 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear
- 10 (ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:271:

ATGGACCTGC CCCCGCAGCT CTCTTCGGC CTCTATGTGG CCGCCTTTGC GCTGGGCTTC 60
CCGCTCAACG TCCTGGCCAT CCGAGGCGCG ACGGCCACG CCCGGCTCCG TCTACCCCT 120
15 AGCCTGGTCT ACGCCCTGAA CCTGGGCTGC TCCGACCTGC TGCTGACAGT CTCTCTGCCC 180
CTGAAGGCGG TGGAGGCGCT AGCCTCCGGG GCCTGGCCTC TGCCGGCCTC GCTGTGCCCC 240
GTCTTCGCGG TGGCCCACTT CTTCCTCACTC TATGCCGCGG GGGGCTTCTT GGCCGCCCTG 300
AGTGCAGGCC GCTACCTGGG AGCAGCCTTC CCCTTGGGCT ACCAAGCCTT CCGGAGGCCG 360
TGCTATTCTT GGGGGGTGTG CGCGGCCATC TGGGCCCTCG TCCTGTGTCA CCTGGGTCTG 420
20 GTCTTTGGGT TGAGGCTCC AGGAGGCTGG CTGGACCACA GCAACACCTC CCTGGGCATC 480
AACACACCGG TCAACGGCTC TCCGGTCTGC CTGGAGGCCT GGGACCCGGC CTCTGCCGGC 540
CCGGCCCGCT TCAGCCTCTC TCTCCTGCTC TTTTTTCTGC CCTTGGCCAT CACAGCCTTC 600
TGCTACGTGG GCTGCCTCCG GGCACGTGCC CGCTCCGGCC TGACGCACAG GCGGAAGCTG 660
CGGGCCAAAT GGGTGGCCGG CGGGGCCCTC CTCACGCTGC TGCTCTGCGT AGGACCTTAC 720
25 AAGCCTCCA ACGTGGCCAG CTTCCTGTAC CCCAATCTAG GAGGCTCCTG GCGGAAGCTG 780
GGGCTCATCA CGGTGCCTG GAGTGTGGTG CTTAATCCGC TGGTGACCGG TTAATTGGGA 840
AGGGGTCCTG GCCTGAAGAC AGTGTGTGCG GCAAGAACGC AAGGGGGCAA GTCACAGAAG 900
TAA 903

(273) INFORMATION FOR SEQ ID NO:272:

- 30 (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 300 amino acids
(B) TYPE: amino acid
(C) STRANDEDNESS:

225

(D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:272:

5 Met Asp Leu Pro Pro Gln Leu Ser Phe Gly Leu Tyr Val Ala Ala Phe
 1 5 10 15
 Ala Leu Gly Phe Pro Leu Asn Val Leu Ala Ile Arg Gly Ala Thr Ala
 20 25 30
 His Ala Arg Leu Arg Leu Thr Pro Ser Leu Val Tyr Ala Leu Asn Leu
 35 40 45
 10 Gly Cys Ser Asp Leu Leu Leu Thr Val Ser Leu Pro Leu Lys Ala Val
 50 55 60
 Glu Ala Leu Ala Ser Gly Ala Trp Pro Leu Pro Ala Ser Leu Cys Pro
 65 70 75 80
 15 Val Phe Ala Val Ala His Phe Phe Pro Leu Tyr Ala Gly Gly Gly Phe
 85 90 95
 Leu Ala Ala Leu Ser Ala Gly Arg Tyr Leu Gly Ala Ala Phe Pro Leu
 100 105 110
 Gly Tyr Gln Ala Phe Arg Arg Pro Cys Tyr Ser Trp Gly Val Cys Ala
 115 120 125
 20 Ala Ile Trp Ala Leu Val Leu Cys His Leu Gly Leu Val Phe Gly Leu
 130 135 140
 Glu Ala Pro Gly Gly Trp Leu Asp His Ser Asn Thr Ser Leu Gly Ile
 145 150 155 160
 25 Asn Thr Pro Val Asn Gly Ser Pro Val Cys Leu Glu Ala Trp Asp Pro
 165 170 175
 Ala Ser Ala Gly Pro Ala Arg Phe Ser Leu Ser Leu Leu Phe Phe
 180 185 190
 Leu Pro Leu Ala Ile Thr Ala Phe Cys Tyr Val Gly Cys Leu Arg Ala
 195 200 205
 30 Leu Ala Arg Ser Gly Leu Thr His Arg Arg Lys Leu Arg Ala Lys Trp
 210 215 220
 Val Ala Gly Gly Ala Leu Leu Thr Leu Leu Leu Cys Val Gly Pro Tyr
 225 230 235 240
 35 Asn Ala Ser Asn Val Ala Ser Phe Leu Tyr Pro Asn Leu Gly Gly Ser
 245 250 255
 Trp Arg Lys Leu Gly Leu Ile Thr Gly Ala Trp Ser Val Val Leu Asn

226

260

265

270

Pro Leu Val Thr Gly Tyr Leu Gly Arg Gly Pro Gly Leu Lys Thr Val
 275 280 285

Cys Ala Ala Arg Thr Gln Gly Gly Lys Ser Gln Lys
 290 295 300

(274) INFORMATION FOR SEQ ID NO:273:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 1041 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:273:

ATGGATACAG GCCCGACCA GTCCTACTTC TCCGSCAATC ACTGGITCGT CTCTCAGGTG 60
 15 TACCTTCTCA CTTTCCTGGT GGGGCTCCCC CTCACCTGCG TGGCCCTGGT GGTCTTCGTG 120
 GGCAGAGCTGC AGCGCCGCC GGTGGCCGTG GACGTGCTCC TGCTCAACCT GACCGCCTCG 180
 GACCTGCTCC TGCTGCTGTT CCTGCTTTTC CGCATGGTGG AGGCAGSCAA TGGCATGCAC 240
 TGGCCCCGCG CCTTCATCCT CTGCCCACCTC TCTGGATTCA TCTTCTTCAC CACCATCTAT 300
 CTCACCGCCC TCTTCTCGGC AGCTGTGAGC ATTGAACGCT TCCTGAGTGT GGGCCACCCA 360
 20 CTGTGGTACA AGACCCGGCC GAGGCTGGGG CAGGCAGGTC TGCTGAGTGT GGCCTGCTGG 420
 CTGTTGGCCT CTGCTCACTG CAGCGTGGTC TACGTCATAG AATTCACAGG GGACATCTCC 480
 CACAGCCAGG GCACCAATGG GACCTGCTAC CTGGAGTTCC GGAAGGACCA GCTAGCCATC 540
 CTCTGCCCCG TCGGCTGGA GATGGCTGTG GTCCCTCTTG TGCTCCCGCT GATCATCACC 600
 AGCTACTGCT ACAGCCGCCT GGTGTGGATC CTCGGCAGAG GGGGCAGSCA CCGCCGGCAG 660
 25 AGGAGGGTGA AGGGGCTGTT GCGGCCACG CTGCTCAACT TCCTTGCTG CTTTGGGCCC 720
 TACAACGTGT CCCATGTCGT GGGCTATATC TCGGGTGAAA GCCCGCATG GAGGAICTAC 780
 GTGACGCTTC TCAGCACCTT GAACTCCTGT GTCGACCCCT TTGTCTACTA CTTCCTCTCC 840
 TCCGGGTTCC AAGCCGACTT TCATGAGCTG CTGAGGAGGT TGTGTGGGCT CTGGGGCCAG 900
 TGGCAGCAGG AGAGCAGCAT GGAGCTGAAG GAGCAGAAGG GAGGGGAGGA GCAGAGAGCG 960
 30 GACCGACCAG CTGAAAGAAA GACCAAGTAA CACTCACAGG GCTGTGGAAC TGGTGGCCAG 1020
 GTGGCCTGTG CTGAAAGCTA G 1041

(275) INFORMATION FOR SEQ ID NO:274:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 346 amino acids

(B) TYPE: amino acid

(C) STRANDEDNESS:

(D) TOPOLOGY: not relevant

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:274:

10 Met Asp Thr Gly Pro Asp Gln Ser Tyr Phe Ser Gly Asn His Trp Phe
 1 5 10 15
 Val Phe Ser Val Tyr Leu Leu Thr Phe Leu Val Gly Leu Pro Leu Asn
 20 25 30
 Leu Leu Ala Leu Val Val Phe Val Gly Lys Leu Gln Arg Arg Pro Val
 35 40 45
 15 Ala Val Asp Val Leu Leu Leu Asn Leu Thr Ala Ser Asp Leu Leu Leu
 50 55 60
 Leu Leu Phe Leu Pro Phe Arg Met Val Glu Ala Ala Asn Gly Met His
 65 70 75 80
 20 Trp Pro Leu Pro Phe Ile Leu Cys Pro Leu Ser Gly Phe Ile Phe Phe
 85 90 95
 Thr Thr Ile Tyr Leu Thr Ala Leu Phe Leu Ala Ala Val Ser Ile Glu
 100 105 110
 Arg Phe Leu Ser Val Ala His Pro Leu Trp Tyr Lys Thr Arg Pro Arg
 115 120 125
 25 Leu Gly Gln Ala Gly Leu Val Ser Val Ala Cys Trp Leu Leu Ala Ser
 130 135 140
 Ala His Cys Ser Val Val Tyr Val Ile Glu Phe Ser Gly Asp Ile Ser
 145 150 155 160
 30 His Ser Gln Gly Thr Asn Gly Thr Cys Tyr Leu Glu Phe Arg Lys Asp
 165 170 175
 Gln Leu Ala Ile Leu Leu Pro Val Arg Leu Glu Met Ala Val Val Leu
 180 185 190
 Phe Val Val Pro Leu Ile Ile Thr Ser Tyr Cys Tyr Ser Arg Leu Val
 195 200 205
 35 Trp Ile Leu Gly Arg Gly Gly Ser His Arg Arg Gln Arg Arg Val Lys
 210 215 220
 Gly Leu Leu Ala Ala Thr Leu Leu Asn Phe Leu Val Cys Phe Gly Pro

228

	225		230		235		240
	Tyr Asn Val Ser His Val Val Gly Tyr Ile Cys Gly Glu Ser Pro Ala						
		245			250		255
5	Trp Arg Ile Tyr Val Thr Leu Leu Ser Thr Leu Asn Ser Cys Val Asp						
		260		265		270	
	Pro Phe Val Tyr Tyr Phe Ser Ser Ser Gly Phe Gln Ala Asp Phe His						
		275		280		285	
	Glu Leu Leu Arg Arg Leu Cys Gly Leu Trp Gly Gln Trp Gln Gln Glu						
		290		295		300	
10	Ser Ser Met Glu Leu Lys Glu Gln Lys Gly Gly Glu Glu Gln Arg Ala						
		305		310		315	320
	Asp Arg Pro Ala Glu Arg Lys Thr Ser Glu His Ser Gln Gly Cys Gly						
		325		330		335	
15	Thr Gly Gly Gln Val Ala Cys Ala Glu Ser						
		340		345			

(276) INFORMATION FOR SEQ ID NO:275:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 993 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: single
 - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:275:

	ATGCTGCCGG	ACTGGAAGAG	CTCCTTGATC	CTCATGGCTT	ACATCATCAT	CTTCCTCACT	60
25	GGCCTCCCTG	CCAACCTCCT	GGCCCTGCGG	GCCTTTGTGG	GGCGGATCCG	CCAGCCCCAG	120
	CCTGCACCTG	TGCACATCCT	CCTGCTGAGC	CTGACGCTGG	CCGACCTCCT	CCTGCTGCTG	180
	CTGCTGCCCT	TCAAGATCAT	CGAGGCTGCG	TCGAACCTCC	GCTGGTACCT	GCCCAAGGTC	240
	GTCTGCGCCC	TCACGAGTTT	TGGCTTCTAC	AGCAGCATCT	ACTGCAGCAC	GTGGCTCCTG	300
	GCGGGCATCA	GCATCGAGCG	CTACCTGGGA	GTGGCTTTCC	CCGTGCAGTA	CAAGCTCTCC	360
30	CGCGCGGCTC	TGTATGGAGT	GATTGCAGCT	CTGTGGCCTT	GGGTTATGTC	CTTTGGTCAC	420
	TGCACCATCG	TGATCATCGT	TCAATACTTG	AACACGACTG	AGCAGGTCAG	AAGTGGCAAT	480
	GAAATTACCT	GCTACGAGAA	CTTCACCGAT	AACCAAGTTG	ACGTGGTGCT	GCCCGTGCGG	540
	CTGGAGCTGT	GCCTGGTGCT	CTTCTTCATC	CCCATGGCAG	TCACCATCTT	CTGCTACTGG	600

CGTTTGTGT GGATCATGCT CTCCAGCCCC CTGTGGGGG CCCAGAGGCG GCGCCGAGCC 660
 AAGGGGCTGG CTGTGGTGAC GCTGCTCAAT TTCCTGGTGT GCTTCGGACC TTACAACGTG 720
 TCCACCTGG TGGGTATCA CCAGAGAAAA AGCCCTGGT GCGGTCAAT AGCCGTGGTG 780
 TTCAGTTCAC TCAACGCCAG TCTGGACCCC CTGCTCTTCT ATTCTCTTC TTCAGTGGTG 840
 5 CGCAGGGCAT TTGGGAGAGG GCTGCAGGTG CTGCGGAATC AGGGCTCCTC CCTGTTGGGA 900
 CGCAGAGGCA AAGACACAGC AGAGGGGACA AATGAGGACA GGGGTGTGGG TCARAGGAGAA 960
 GGGATGCCAA GTTCGGACTT CACTACAGAG TAG 993

(277) INFORMATION FOR SEQ ID NO:276:

- 10 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 330 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant
 (ii) MOLECULE TYPE: protein

- 15 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:276:

Met Leu Pro Asp Trp Lys Ser Ser Leu Ile Leu Met Ala Tyr Ile Ile
 1 5 10 15
 Ile Phe Leu Thr Gly Leu Pro Ala Asn Leu Leu Ala Leu Arg Ala Phe
 20 25 30
 20 Val Gly Arg Ile Arg Gln Pro Gln Pro Ala Pro Val His Ile Leu Leu
 35 40 45
 Leu Ser Leu Thr Leu Ala Asp Leu Leu Leu Leu Leu Leu Leu Pro Phe
 50 55 60
 25 Lys Ile Ile Glu Ala Ala Ser Asn Phe Arg Trp Tyr Leu Pro Lys Val
 65 70 75 80
 Val Cys Ala Leu Thr Ser Phe Gly Phe Tyr Ser Ser Ile Tyr Cys Ser
 85 90 95
 Thr Trp Leu Leu Ala Gly Ile Ser Ile Glu Arg Tyr Leu Gly Val Ala
 100 105 110
 30 Phe Pro Val Gln Tyr Lys Leu Ser Arg Arg Pro Leu Tyr Gly Val Ile
 115 120 125
 Ala Ala Leu Val Ala Trp Val Met Ser Phe Gly His Cys Thr Ile Val
 130 135 140
 35 Ile Ile Val Gln Tyr Leu Asn Thr Thr Glu Gln Val Arg Ser Gly Asn
 145 150 155 160

230

Glu Ile Thr Cys Tyr Glu Asn Phe Thr Asp Asn Gln Leu Asp Val Val
 165 170 175
 Leu Pro Val Arg Leu Glu Leu Cys Leu Val Leu Phe Phe Ile Pro Met
 180 185 190
 5 Ala Val Thr Ile Phe Cys Tyr Trp Arg Phe Val Trp Ile Met Leu Ser
 195 200 205
 Gln Pro Leu Val Gly Ala Gln Arg Arg Arg Arg Ala Lys Gly Leu Ala
 210 215 220
 10 Val Val Thr Leu Leu Asn Phe Leu Val Cys Phe Gly Pro Tyr Asn Val
 225 230 235 240
 Ser His Leu Val Gly Tyr His Gln Arg Lys Ser Pro Trp Trp Arg Ser
 245 250 255
 Ile Ala Val Val Phe Ser Ser Leu Asn Ala Ser Leu Asp Pro Leu Leu
 260 265 270
 15 Phe Tyr Phe Ser Ser Ser Val Val Arg Arg Ala Phe Gly Arg Gly Leu
 275 280 285
 Gln Val Leu Arg Asn Gln Gly Ser Ser Leu Leu Gly Arg Arg Gly Lys
 290 295 300
 20 Asp Thr Ala Glu Gly Thr Asn Glu Asp Arg Gly Val Gly Gln Gly Glu
 305 310 315 320
 Gly Met Pro Ser Ser Asp Phe Thr Thr Glu
 325 330

(278) INFORMATION FOR SEQ ID NO:277:

- 25 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 2724 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
 (ii) MOLECULE TYPE: DNA (genomic)
 30 (xi) SEQUENCE DESCRIPTION: SEQ ID NO:277:
 ATGGACACCT CCCGCTCGG TGTGCTCCTG TCCTTGCCTG TGCTGCTGCA GCTGGCGACC 60
 GGGGGCAGCT CTCCCAGGTC TGGTGTGTTG CTGAGGGGCT GCCCACACA CTGTCATTGC 120
 GAGCCCAGAC GCAGGATGTT GCTCAGGGTG GACTGCTCCG ACCTGGGGCT CTCGGAGCTG 180
 CCTTCCAACC TCAGCGTCTT CACCTCCTAC CTAGACCTCA GTATGAACAA CATCAGTCAG 240
 35 CTGCTCCCGA ATCCCTGCC CAGTCTCCGC TTCTGGAGG AGTTACGTCT TGCGGGAAAC 300

	GCTCTGACAT	ACATICCCAA	GGGAGCATT	CTGGCCTTT	ACAGTCTTAA	AGTTCTTATG	360
	CTGCAGAATA	ATCAGCTAAG	ACACGTACCC	ACAGAAGCTC	TGCAGAAATT	GCGAAGCCTT	420
	CAATCCCTGC	GTCTGGATGC	TAACCACATC	AGCTATGTGC	CCCCAAGCTG	TTTCAGTGGC	480
	CTGCATTTCC	TGAGGCACCT	GTGGCTGGAT	GACAATGCGT	TAACAGAAAT	CCCCGTCCAG	540
5	GCTTTTAGAA	GTTTATCGGC	ATTGCAAGCC	ATGACCTTGG	CCCTGAACAA	AATACACCAC	600
	ATACCAAGACT	ATGCCTTTGG	AAACCTCTCC	AGCTTGGTAG	TTCTACATCT	CCATAACAAT	660
	AGAATCCACT	CCCTGGGAAA	GAAATGCTTT	GATGGGCTCC	ACAGCCTAGA	GACTTTAGAT	720
	TTAAATTACA	ATAACCTTGA	TGAATTCCTC	ACTGCAATTA	GGACACTCTC	CAACCTTAAA	780
	GAACTAGGAT	TTCATAGCAA	CAATATCAGG	TCGATACCTG	AGAAAGCATT	TGTAGGCAAC	840
10	CCTTCTCTTA	TTACAATACA	TTTCTATGAC	AATCCCATCC	AATTTGTGG	GAGATCTGCT	900
	TTTCAACATT	TACCTGAAT	AAGAACACTG	ACTCTGAATG	GTGCCTCACA	AATAACTGAA	960
	TTTCTGATT	TAACCTGGAAC	TGCAAACTG	GAGAGTCTGA	CTTTAACTGG	AGCACAGATC	1020
	TCATCTCTTC	CTCAAACTGT	CTGCAATCAG	TTACCTAATC	TCCAAGTGCT	AGATCTGTCT	1080
	TACAACCTAT	TAGAAGATT	ACCCAGTTTT	TCAGTCTGCC	AAAAGCTTCA	GAATAATGAC	1140
15	CTAAGACATA	ATGAAATCTA	CGAAATTTAA	GTTGACACTT	TCCAGCAGTT	GCTTAGCCTC	1200
	CGATCGCTGA	ATTGCGCTTG	GAACAAAATT	GCTATTATTC	ACCCCAATGC	ATTTTCCACT	1260
	TGSCCATCCC	TAATAAAGCT	GGACCTATCG	TCCAACCTCC	TGTCGTCTTT	TCCATAACT	1320
	GGGTACATG	GTTTAACTCA	CTTAAAATTA	ACAGGAAATC	ATGCCCTTACA	GAGCTTGATA	1380
	TCATCTGAAA	ACTTTCCAGA	ACTCAAGGTT	ATAGAAATGC	CTTATGCTTA	CCAGTGCTGT	1440
20	GCATTTGGAG	TGTGTGAGAA	TGCCTATAAG	ATTTCTAATC	AATGGAATAA	AGGTGACAAC	1500
	AGCAGTATGG	ACGACCTTCA	TAAGAAAGAT	GCTGGAATGT	TTCAGGCTCA	AGATGAACGT	1560
	GACCTTGAAG	ATTTCTCTGT	TGACTTTGAG	GAAGACCTGA	AAGCCCTTCA	TTCAGTGCAG	1620
	TGTTACCTTT	CCCCAGGCC	CTTCAAAACC	TGTGAACACC	TGCTTGATGG	CTGGCTGATC	1680
	AGAATTGGAG	TGTGGACCAT	AGCAGTCTTG	GCACCTTACT	GTAATGCTTT	GGTGACTTCA	1740
25	ACAGTTTTCA	GATCCCTCT	GTACATTTCC	CCCAATTAAC	TGTTAATTGG	GGTCATCGCA	1800
	GCAGTGAACA	TGCTCACGGG	AGTCTCCAGT	GCCGTGCTGG	CTGGTGTGGA	TGCGTTCACT	1860
	TTTGGCAGCT	TTGCACGACA	TGGTGCCTGG	TGGGAGAATG	GGGTGTGGTG	CCATGTCATT	1920
	GGTPTTTTGT	CCATTTTTCG	TTCAAGATCA	TCTGTTTTTC	TGCTTACTCT	GGCAGCCCTG	1980

GAGCGTGGGT TCTCTGTGAA ATATTCTGCA AAATTGTAAA CGAAAGCTCC ATTTTCTAGC 2040
 CTGAAAGTAA TCATTTTGCT CTGTGCCCTG CTGGCCTTGA CCATGGCCGC AGTTCCCCTG 2100
 CTGGGTGGCA GCAAGTATGG CGCCTCCCCT CTCTGCCTGC TTTTGCCCTT TGGGGAGCCC 2160
 AGCACCATGG GCTACATGGT CGCTCTCATC TTGCTCAATT CCCTTGCTT CCTCATGATG 2220
 5 ACCATTGCCT ACACCAAGCT CTACTGCAAT TTGGACAAGG GAGACCTGGA GAATATTG 2280
 GACTGCTCTA TGA AAAACA CATTGCCCTG TTGCTCTTCA CCAACTGCAT CCTAACTGC 2340
 CCTGTGGCTT TCTTGCTCTT CTCCTCTTTA ATAAACCTTA CATTATCAG TCCTGAAGTA 2400
 ATTAAGTTTA TCCTTCTGGT GGTAGTCCCA CTTCTGCAT GTCTCAATCC CCTTCTCTAC 2460
 ATCTTGTTCA ATCCTCACTT TAAGGAGGAT CTGGTGAGCC TGAGAAAGCA AACCTACGTC 2520
 10 TGGACAAGAT CAAAAACCC AAGCTTGATG TCAATTAACT CTGATGATGT CGAAAAACAG 2580
 TCCTGTGACT CAACTCAAGC CTGGTAACC TTTACCAGCT CCAGCATCAC TTATGACCTG 2640
 CCTCCCAGTT CCGTGCCATC ACCAGCTTAT CCACTGACTG AGAGCTGCCA TCTTTCCTCT 2700
 GTGGCATTG TCCCATGTCT CTAA 2724

(279) INFORMATION FOR SEQ ID NO:278:

- 15 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 907 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: not relevant

- 20 (ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:278:

Met Asp Thr Ser Arg Leu Gly Val Leu Leu Ser Leu Pro Val Leu Leu
 1 5 10 15
 Gln Leu Ala Thr Gly Gly Ser Ser Pro Arg Ser Gly Val Leu Leu Arg
 20 25 30
 Gly Cys Pro Thr His Cys His Cys Glu Pro Asp Gly Arg Met Leu Leu
 35 40 45
 Arg Val Asp Cys Ser Asp Leu Gly Leu Ser Glu Leu Pro Ser Asn Leu
 50 55 60
 30 Ser Val Phe Thr Ser Tyr Leu Asp Leu Ser Met Asn Asn Ile Ser Gln
 65 70 75 80
 Leu Leu Pro Asn Pro Leu Pro Ser Leu Arg Phe Leu Glu Glu Leu Arg
 85 90 95

233

Leu Ala Gly Asn Ala Leu Thr Tyr Ile Pro Lys Gly Ala Phe Thr Gly
 100 105 110
 Leu Tyr Ser Leu Lys Val Leu Met Leu Gln Asn Asn Gln Leu Arg His
 115 120 125
 5 Val Pro Thr Glu Ala Leu Gln Asn Leu Arg Ser Leu Gln Ser Leu Arg
 130 135 140
 Leu Asp Ala Asn His Ile Ser Tyr Val Pro Pro Ser Cys Phe Ser Gly
 145 150 155 160
 10 Leu His Ser Leu Arg His Leu Trp Leu Asp Asp Asn Ala Leu Thr Glu
 165 170 175
 Ile Pro Val Gln Ala Phe Arg Ser Leu Ser Ala Leu Gln Ala Met Thr
 180 185 190
 Leu Ala Leu Asn Lys Ile His His Ile Pro Asp Tyr Ala Phe Gly Asn
 195 200 205
 15 Leu Ser Ser Leu Val Val Leu His Leu His Asn Asn Arg Ile His Ser
 210 215 220
 Leu Gly Lys Lys Cys Phe Asp Gly Leu His Ser Leu Glu Thr Leu Asp
 225 230 235 240
 20 Leu Asn Tyr Asn Asn Leu Asp Glu Phe Pro Thr Ala Ile Arg Thr Leu
 245 250 255
 Ser Asn Leu Lys Glu Leu Gly Phe His Ser Asn Asn Ile Arg Ser Ile
 260 265 270
 Pro Glu Lys Ala Phe Val Gly Asn Pro Ser Leu Ile Thr Ile His Phe
 275 280 285
 25 Tyr Asp Asn Pro Ile Gln Phe Val Gly Arg Ser Ala Phe Gln His Leu
 290 295 300
 Pro Glu Leu Arg Thr Leu Thr Leu Asn Gly Ala Ser Gln Ile Thr Glu
 305 310 315 320
 30 Phe Pro Asp Leu Thr Gly Thr Ala Asn Leu Glu Ser Leu Thr Leu Thr
 325 330 335
 Gly Ala Gln Ile Ser Ser Leu Pro Gln Thr Val Cys Asn Gln Leu Pro
 340 345 350
 Asn Leu Gln Val Leu Asp Leu Ser Tyr Asn Leu Leu Glu Asp Leu Pro
 355 360 365
 35 Ser Phe Ser Val Cys Gln Lys Leu Gln Lys Ile Asp Leu Arg His Asn
 370 375 380
 Glu Ile Tyr Glu Ile Lys Val Asp Thr Phe Gln Gln Leu Leu Ser Leu

234

	385		390		395		400									
	Arg	Ser	Leu	Asn	Leu	Ala	Trp	Asn	Lys	Ile	Ala	Ile	Ile	His	Pro	Asn
				405						410						415
5	Ala	Phe	Ser	Thr	Leu	Pro	Ser	Leu	Ile	Lys	Leu	Asp	Leu	Ser	Ser	Asn
				420					425					430		
	Leu	Leu	Ser	Ser	Phe	Pro	Ile	Thr	Gly	Leu	His	Gly	Leu	Thr	His	Leu
			435					440					445			
	Lys	Leu	Thr	Gly	Asn	His	Ala	Leu	Gln	Ser	Leu	Ile	Ser	Ser	Glu	Asn
		450					455					460				
10	Phe	Pro	Glu	Leu	Lys	Val	Ile	Glu	Met	Pro	Tyr	Ala	Tyr	Gln	Cys	Cys
	465					470					475					480
	Ala	Phe	Gly	Val	Cys	Glu	Asn	Ala	Tyr	Lys	Ile	Ser	Asn	Gln	Trp	Asn
				485					490						495	
15	Lys	Gly	Asp	Asn	Ser	Ser	Met	Asp	Asp	Leu	His	Lys	Lys	Asp	Ala	Gly
			500					505						510		
	Met	Phe	Gln	Ala	Gln	Asp	Glu	Arg	Asp	Leu	Glu	Asp	Phe	Leu	Leu	Asp
		515					520						525			
	Phe	Glu	Glu	Asp	Leu	Lys	Ala	Leu	His	Ser	Val	Gln	Cys	Ser	Pro	Ser
		530				535						540				
20	Pro	Gly	Pro	Phe	Lys	Pro	Cys	Glu	His	Leu	Leu	Asp	Gly	Trp	Leu	Ile
	545					550					555					560
	Arg	Ile	Gly	Val	Trp	Thr	Ile	Ala	Val	Leu	Ala	Leu	Thr	Cys	Asn	Ala
				565						570					575	
25	Leu	Val	Thr	Ser	Thr	Val	Phe	Arg	Ser	Pro	Leu	Tyr	Ile	Ser	Pro	Ile
				580					585						590	
	Lys	Leu	Leu	Ile	Gly	Val	Ile	Ala	Ala	Val	Asn	Met	Leu	Thr	Gly	Val
			595					600					605			
	Ser	Ser	Ala	Val	Leu	Ala	Gly	Val	Asp	Ala	Phe	Thr	Phe	Gly	Ser	Phe
		610				615						620				
30	Ala	Arg	His	Gly	Ala	Trp	Trp	Glu	Asn	Gly	Val	Gly	Cys	His	Val	Ile
	625					630					635					640
	Gly	Phe	Leu	Ser	Ile	Phe	Ala	Ser	Glu	Ser	Ser	Val	Phe	Leu	Leu	Thr
				645					650						655	
35	Leu	Ala	Ala	Leu	Glu	Arg	Gly	Phe	Ser	Val	Lys	Tyr	Ser	Ala	Lys	Phe
			660					665							670	
	Glu	Thr	Lys	Ala	Pro	Phe	Ser	Ser	Leu	Lys	Val	Ile	Ile	Leu	Leu	Cys
		675						680					685			

235

Ala Leu Leu Ala Leu Thr Met Ala Ala Val Pro Leu Leu Gly Gly Ser
690 695 700

Lys Tyr Gly Ala Ser Pro Leu Cys Leu Pro Leu Pro Phe Gly Glu Pro
705 710 715 720

5 Ser Thr Met Gly Tyr Met Val Ala Leu Ile Leu Leu Asn Ser Leu Cys
725 730 735

Phe Leu Met Met Thr Ile Ala Tyr Thr Lys Leu Tyr Cys Asn Leu Asp
740 745 750

10 Lys Gly Asp Leu Glu Asn Ile Trp Asp Cys Ser Met Lys Lys His Ile
755 760 765

Ala Leu Leu Leu Phe Thr Asn Cys Ile Leu Asn Cys Pro Val Ala Phe
770 775 780

Leu Ser Phe Ser Ser Leu Ile Asn Leu Thr Phe Ile Ser Pro Glu Val
785 790 795 800

15 Ile Lys Phe Ile Leu Leu Val Val Val Pro Leu Pro Ala Cys Leu Asn
805 810 815

Pro Leu Leu Tyr Ile Leu Phe Asn Pro His Phe Lys Glu Asp Leu Val
820 825 830

20 Ser Leu Arg Lys Gln Thr Tyr Val Trp Thr Arg Ser Lys His Pro Ser
835 840 845

Leu Met Ser Ile Asn Ser Asp Asp Val Glu Lys Gln Ser Cys Asp Ser
850 855 860

Thr Gln Ala Leu Val Thr Phe Thr Ser Ser Ser Ile Thr Tyr Asp Leu
865 870 875 880

25 Pro Pro Ser Ser Val Pro Ser Pro Ala Tyr Pro Val Thr Glu Ser Cys
885 890 895

His Leu Ser Ser Val Ala Phe Val Pro Cys Leu
900 905

(280) INFORMATION FOR SEQ ID NO:279:

- 30 (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 32 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear
- 35 (ii) MOLECULE TYPE: DNA (genomic)
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:279:

CATGCCAACC GGCCCGCAG GCTGCTGCTG GT

236

(281) INFORMATION FOR SEQ ID NO:280:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 32 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:280:

ACCAGCAGCA GCCTCGCGGG CCGGTTGGCA TG

32

INTERNATIONAL SEARCH REPORT

Int. l. Application No
PCT/US 99/23938

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C12N15/12 C07K14/72 G01N33/50 G01N33/566

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C12N C07K G01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KJELSGERD M. A. ET AL.: "CONSTITUTIVE ACTIVATION OF THE ALPHA1B-ADRENERGIC RECEPTOR BY ALL AMINO ACID SUBSTITUTIONS AT A SINGLE SITE" JOURNAL OF BIOLOGICAL CHEMISTRY, vol. 267, no. 3, 25 January 1992 (1992-01-25), pages 1430-1433, XP002911764 ISSN: 0021-9258 the whole document --- -/-	1,2, 4-13, 15-33, 35-37,41

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubt on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search

2 March 2000

Date of mailing of the international search report

09/03/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5618 Patentlaan 2
NL - 2220 HV Rijswijk
Tel: (+31-70) 340-2040, Tx. 31651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Mandl, B

INTERNATIONAL SEARCH REPORT

Int. l. Application No
PCT/US 99/23938

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No
X	SCHEER A. ET AL.: "CONSTITUTIVELY ACTIVE G PROTEIN-COUPLED RECEPTORS: POTENTIAL MECHANISMS OF RECEPTOR ACTIVATION" JOURNAL OF RECEPTOR AND SIGNAL TRANSDUCTION RESEARCH, vol. 17, no. 1/03, 1997, pages 57-73, XP000867531 ISSN: 1079-9893 the whole document	1,2, 4-13, 15-33, 35-37,41
X	WO 97 21731 A (NEW ENGLAND MEDICAL CENTER INC) 19 June 1997 (1997-06-19) the whole document, especially Fig. 2-3	1,2,4, 9-13, 20-32, 35-37,41
X	WO 98 38217 A (HERRICK DAVIS KATHARINE ;TEITLER MILT (US); EGAN CHRISTINA C (US)) 3 September 1998 (1998-09-03) the whole document, especially page 7, lines 24-27, and figure 4	1,2, 4-13, 15-33, 35-37,41
P,X	PAUWELS P. J. ET AL.: "REVIEW: AMINO ACID DOMAINS INVOLVED IN CONSTITUTIVE ACTIVATION OF G-PROTEIN-COUPLED RECEPTORS" MOLECULAR NEUROBIOLOGY, vol. 17, no. 1/03, 1998, pages 109-135, XP000866477 ISSN: 0893-7648 the whole document	1,2, 4-13, 15-33, 35-37,41

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 99/23938

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos.: 34, 38-40, 42, 43
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
See FURTHER INFORMATION sheet PCT/ISA/210

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this International application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International Application No. PCT/US 99 23938

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box I.2

Claims Nos.: 34,38-40,42,43

Claims 34, 38-40, 42 and 43 refer to compounds with an agonistic effect on a GPCR without giving a true technical characterization. Moreover, no such specific compounds are defined in the application. In consequence, the scope of said claims is ambiguous and vague, and their subject-matter is not sufficiently disclosed and supported (Art. 5 and 6 PCT). No search can be carried out for such purely speculative claims whose wording is, in fact, a mere recitation of the results to be achieved.

The applicant's attention is drawn to the fact that claims, or parts of claims, relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure.

INTERNATIONAL SEARCH REPORT

Information on patent family members

Int. l. Application No

PCT/US 99/23938

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
W0 9721731 A	19-06-1997	US 5750353 A	12-05-1998
		AU 1334397 A	03-07-1997
		CA 2239293 A	19-06-1997
		EP 0869975 A	14-10-1998
W0 9838217 A	03-09-1998	AU 6343998 A	18-09-1998